AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

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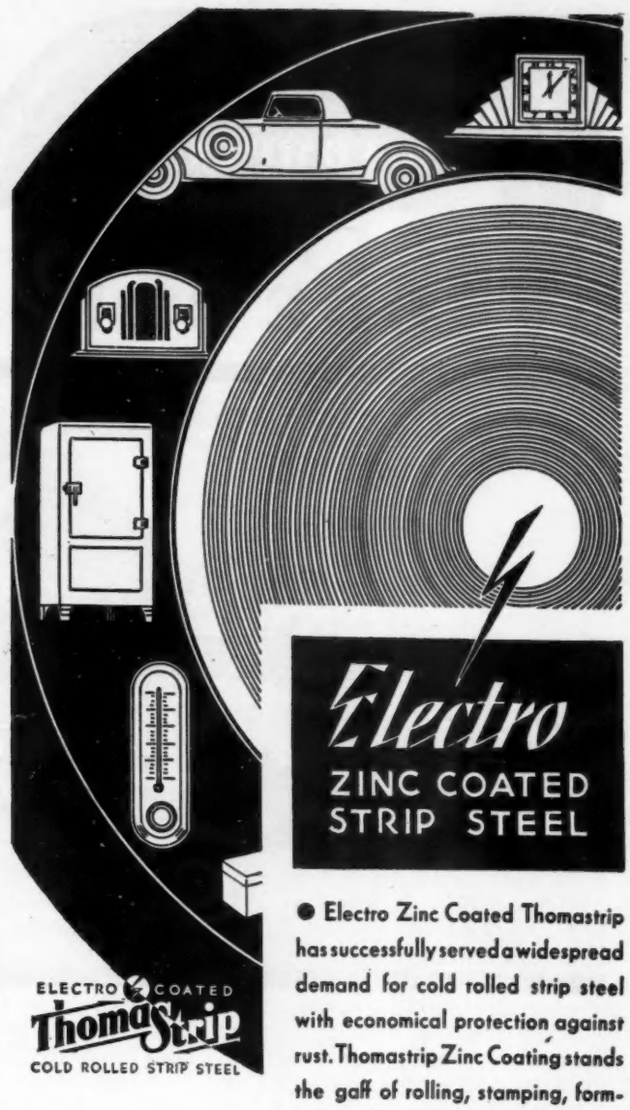

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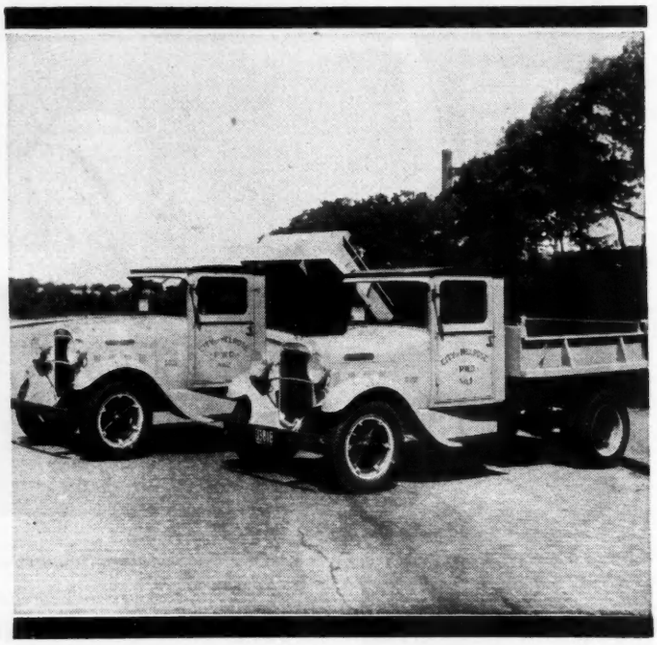

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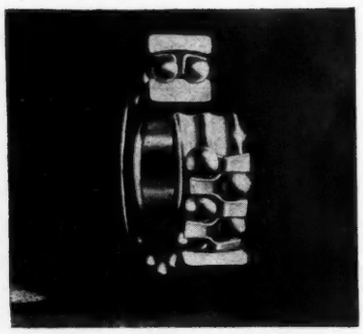

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AUTOMOTIVE INDUSTRIES

Vol. 68, No. 22 • THIRTY-FIFTH YEAR • June 3, 1933

Meyer Averages 104.162 M.P.H. to Set New Indianapolis Mark

Semi-stock jobs demonstrate stamina by taking all places from fifth to fourteenth inclusive

DUPLICATING his 1928 victory, Lou Meyer won the twenty-first annual Indianapolis Sweepstakes at a new record speed of 104.162 m.p.h. in a race that was marred by the death of two drivers and a mechanician. A feature of the contest was the remarkably consistent performance of the semi-stock jobs which took every place from fifth to fourteenth inclusive.

By his Tuesday victory, Meyer now ranks with Tommy Milton, the only other driver with two Indianapolis victories to his credit.

While the new record is only slightly higher than the previous one, which was set last year, it is a truly remarkable speed when one considers that the yellow caution flag was out twice during the race because of accidents resulting in the deaths of three men—Billman, Spangler and Jordan, and the forced elimination of several cars.

The pace was fast from the start, with the leaders and the positions of the cars constantly changing. Bill Cummings, who held the pole position having qualified at 118.521 m.p.h. lead the pack for many laps but finally lost out because of overheating trouble induced by losing a radiator cap and the adoption of makeshifts which did not hold the water.

Fred Frame, who had more than an even chance of duplicating his performance of last year, was in the lead when he cracked into the retaining wall. The other Hartz entry driven by Lester Spangler with his mechanic Jordan, piled into the Universal Service Garage Special driven by Malcolm Fox which had gone into a skid. Both Spangler and Jordan died of their injuries.

The semi-stock cars once again more than justified themselves, for the out and out race cars secured only the first four positions, while cars with revamped passenger car engines took every place from the fifth to the fourteenth inclusive.

Louie Meyer's rear drive winner is the same car that Bob Carey drove into fourth place last year with the bore increased from 3.25 in. to 3.312 in. It is a conventional Miller straight eight racing engine. Wilbur Shaw and Lou Moore, who finished second and third respectively used Miller four cylinder race engines in rear drive chassis, while Chet Gardner, fourth place winner, used a 16-cylinder engine designed by Aldan Sampson, the owner and Reilly Brett racing mechanic. This car, incidentally, is the same car that Louie Meyer has driven in several Indianapolis races, finishing fourth in the 1930 race. For signalling purposes, between the car and the pit, the car was equipped with a radio receiving and transmitting set.

The first of the semi-stock engined jobs to cross the line was the Abels-Fink special driven by Stubblefield and entered by Phil

This picture of Lou Meyer and his mechanic was taken at the close of the great classic which he had just won for the second time

The Field at Indianapolis

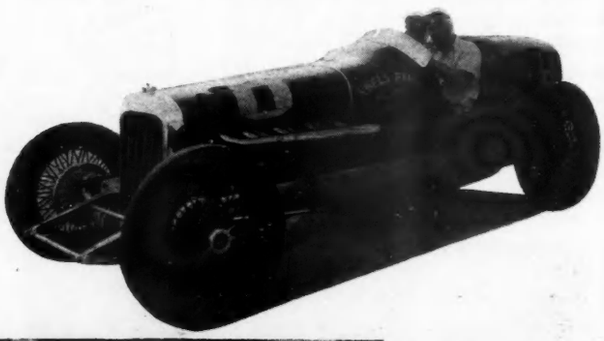
Finished	Driver	Speed	Cyl.	Bore and Stroke	Disp.	Engine Make	Front Rear	Qualif.
1	Louis Meyer	104.162	8	3.312 x 3.75	258	Miller	Rear	116.977
2	Wilbur Shaw	101.795	4	4 1/16 x 4 1/4	220	Miller	Rear	115.497
3	Lou Moore	101.599	4	4 1/4 x 4 1/2	255	Miller	Rear	117.843
4	Chet Gardner	101.182	16	2 1/16 x 3	201	Sampson	Rear	112.319
5	H. Stubblefield	100.762	8	3 1/8 x 4 5/8	284	Buick	Rear	114.784
6	Dave Evans	100.425	8	3.06 x 4 1/2	250	Studebaker	Front	109.448
7	Tony Gulotta	99.071	8	3 1/2 x 4 3/8	337	Studebaker	Rear	113.778
8	R. Snowberger	99.011	8	3 1/2 x 4 3/8	337	Studebaker	Rear	110.769
9	Zeke Meyer	98.122	8	3 1/2 x 4 3/8	337	Studebaker	Rear	111.099
10	Luther Johnson	97.287	8	3 1/2 x 4 3/8	337	Studebaker	Rear	110.097
11	Cliff Bergere	96.586	8	3 1/2 x 4 3/8	337	Studebaker	Rear	115.643
12	L. Corum	96.527	8	3 1/2 x 4 3/8	337	Studebaker	Rear	110.465
13	Wm. Prentice	93.595	8	3 1/2 x 4 3/4	365	Duesenberg	Rear	107.766
14	Raul Riganti	93.244	8	3 3/8 x 5	357	Chrysler	Rear	108.081
	Bill Cummings		8	3.39 x 3.75	270	Miller	Rear	118.521
	E. Stapp		4	4 1/8 x 4 1/8	220	Miller	Front	116.770
	Fred Frame		8	2 7/8 x 3 1/2	182	Miller	Front	117.864
	Lester Spangler		4	4 1/4 x 4 1/2	250	Miller	Rear	116.903
	Al Miller		8	3.015 x 4.5	256	Hudson	Rear	109.799
	Chet Miller		8	3.015 x 4.5	256	Hudson	Rear	112.025
	Ernie Triplett		4	4 1/16 x 4 1/4	220	Miller	Rear	117.658
	Phil Shafer		8	3.18 x 4 5/8	284	Buick	Rear	107.972
	Ira Hall		8	2.92 x 4.625	248	Duesenberg	Rear	115.739
	Frank Brisko		8	3 1/2 x 4	308	Miller	4-W	118.388
	Maurice Rose		8	3 1/4 x 3 3/4	249	Miller	Rear	117.649
	J. Sawyer		4	4 x 4 1/6	220	L. & M.	Rear	110.590
	W. Cantlon		4	4 1/16 x 4 1/4	220	Miller	Rear	113.384
	Rick Decker		8	2.76 x 3.5	168	Miller	Front	108.280
	R. Campbell		8	2.9 x 4.5	244	Hudson	Rear	108.540
	Deacon Litz		4	4 1/16 x 4 1/4	220	Miller	Rear	113.138
	L. Schneider		8	2.625 x 3.5	151	Miller	Rear	109.850
	Malcolm Fox		8	3 1/2 x 4 3/8	337	Studebaker	Rear	112.922
	J. Russo		8	3.48 x 3.62	276	Duesenberg	Rear	112.587
	R. Hepburn		16	2.56 x 4.33	329	Marmon	Front	110.001
	Ben. Hill		16	2.25 x 3	190	Cooper	Front	110.264
	W. Crawford		8	2 5/8 x 3 1/2	151	Miller	Front	109.862
	M. Billman		8	2.9 x 5	268	Duesenberg	Rear	112.401
	Winnai		8				Rear	110.018
	K. Petello		4	4 1/16 x 4 1/4	220	Miller	Rear	113.037
	Paul Bost		4	4 1/16 x 4 1/4	220	Miller	Rear	111.330
	Pete Kreis		8	2 5/8 x 3 1/2	151	Miller	Front	114.370
	McKenzie		8	3.56 x 4 5/8	348	Studebaker	Rear	108.073
	*Haustein		8	2.885 x 4.5	233	Hudson	Rear	107.603

* Alternate

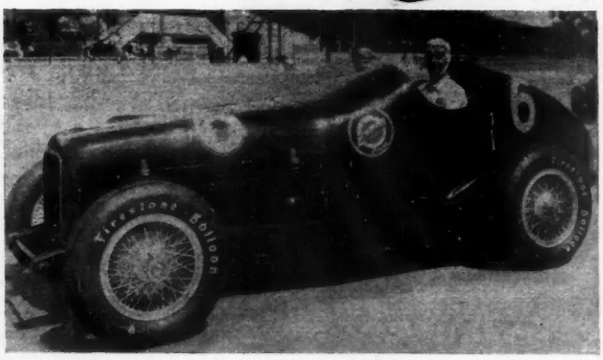
Shafer. This was powered by a Buick engine which had been adapted to racing purposes by Shafer. The car averaged 100.762 m.p.h. for the distance, having qualified at 114,784 m.p.h. Closely following Stubblefield was Dave Evans in a front drive job powered with a Studebaker Commander engine having a displacement of 250 cu. in. Then came Tony Gulotta in the first of the official Studebaker five-car team with only .06 of a mile better average than Snowberger's private entry which came in eighth. Incidentally this is the fourth consecutive year that Snowberger has finished in the money with a semi-stock job.

The remainder of the Studebaker team followed in one, two, three order.

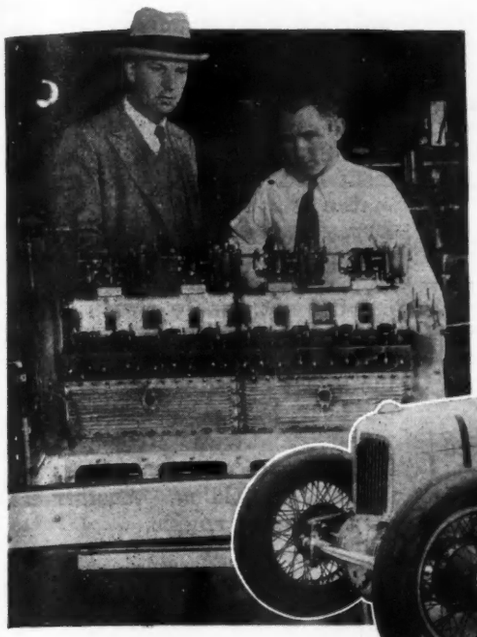
Bill Prentice used a revamped Duesenberg passenger car engine



Stubblefield, using a revamped Buick engine, was the first of the semi-stock jobs to finish

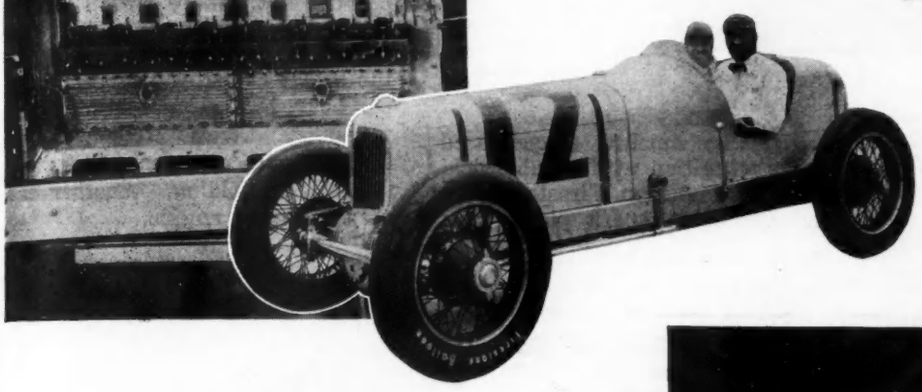


Cliff Bergere in a factory-entered Studebaker finished in eleventh place. Note the unusually high cowl and tail. All the Studebakers entered by the factory finished in the money

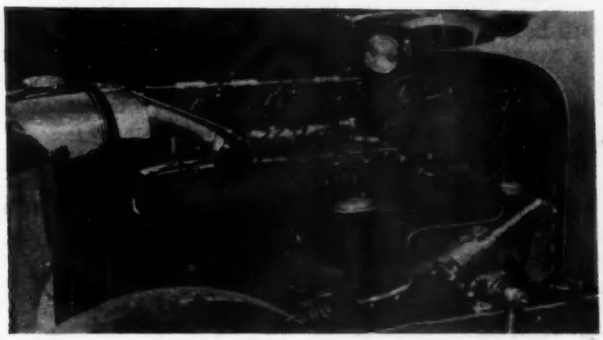


Louie Meyer and Bud Winfield, carburetor engineer, studying the 258 cu. in. Miller engine which Louie drove to victory

Left: Frame, last year's winner, hit the retaining wall



Below: Snowberger's semi - stock Studebaker which finished in eighth place

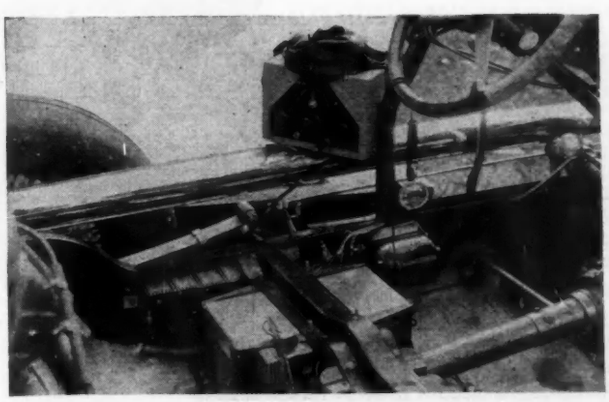


to finish in thirteenth place, while Paul Riganti's car was powered with a Chrysler engine. This was the only foreign entry in the race, haling from South America and sponsored by Juan Gaudino.

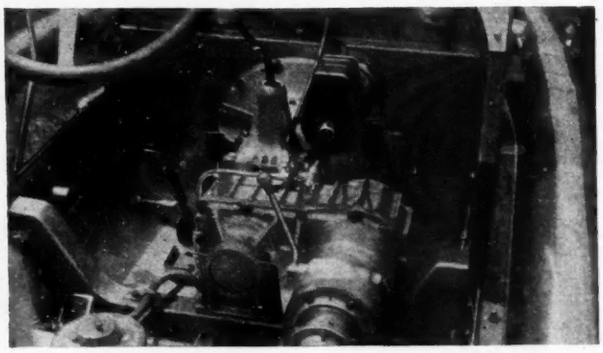
The excellent showing of the Studebaker team in having all five cars finish undoubtedly reflects very careful management. The engines used in these cars had higher compression ratios than used in stock models and special camshafts. With the exception of the car driven by Corum, the cars were fitted with special wind tunnel tested bodies. In this connection it is reported that some of the drivers of these cars complained of nausea during the race and attributed it to poor ventilation in the driving compartment. It is interesting to note that Dave Evans used a Commander eight engine and finished ahead of those cars powered with the President type engine. The fact that Dave's job was a front wheeler may account for the higher average speed.

The new rules limiting fuel tank capacity to 15 gallons and oil to 6 gallons caused some trouble during the race. Frank Brisko in the four-wheel drive car was eliminated in the 46th lap because of lack of oil. Several other cars went out because of the same reason. Several cars also ran out of fuel and it was necessary to carry gasoline to the stalled cars. One of the first to suffer in this manner was Babe Stapp in the Boyle valve special, who was in the lead at the time.

Wesley Crawford in a Boyle valve special went out because of broken axle shaft, examination indicating a surface flaw resulting in fatigue failure. Sawyer fell by the wayside when his mount developed ignition trouble. Altogether there were twenty-four cars eliminated either because of mechanical difficulties or through being wrecked before the end of the race. Hepburn in the Highway Parts Special which was powered with a Marmon 16-cylinder engine was not disqualified as reported in the daily press, but threw a connecting rod. The bore and stroke of this engine were both changed to 2.56 and 4.33 respectively so as to bring its displacement within the limits set by the race rules.



The radio equipment on Sampson Special driven by Chester Gardner into fourth place



The transmission on the four-wheel drive was redesigned to provide better cooling

As previously mentioned Cumming lost the lead at approximately the 100 mile mark because of trouble with the radiator cap, resulting in a long delay at the pits. Frame then jumped into the lead averaging 112.247 m.p.h. for the century. Stapp was the next leader with L. Meyer second. At 250 miles, the average speed had dropped to 109.429 m.p.h. with Stapp still in the lead, still closely followed by Meyer. At 300 miles, Stapp lost the lead when he ran out of fuel and Meyer forged to the front, retaining the position to the end. For the last 25 miles Louie "coasted" around at a speed of about 100 miles per hour so as to conserve his fuel and reduce the possibility of any mechanical trouble.

In addition to the $12,000 Louie made by winning the event, he made several thousand dollars in lap money and equipment prizes.

Winfield carburetors were practically standard equipment on the race cars, the first three cars to finish being so equipped, as were the cars driven by Stubblefield, Snowberger, Prentice, and Riganti. The Studebaker entries were fitted with Stromberg carburetors and Scintilla magnetos. Bosch magnetos were used on the cars finishing in first, third, fourth, sixth, eighth, thirteenth and fourteenth. Wilbur Shaw, who finished second used Mallory ignition while Stubblefield used Delco ignition. Firestone tires and Champion spark plugs were also practically standard equipment.

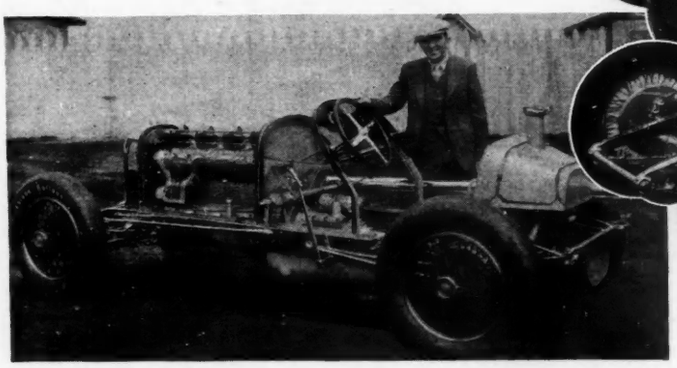
On the whole there was nothing unusual about the design of any of the 42 cars to start with the exception of the radio equipment on the Sampson special, previously mentioned. The engines were all of the four stroke cycle type. The Duray two cycle engine and the Cummins diesel did not enter. Among the cars that were entered but did not qualify was a rebuilt Ford eight which attracted considerable attention. This car lapped the bricks at better than 100 miles per hour, but was not fast enough to qualify. It was fitted with two Detroit Lubricator carburetors and special manifolding. Another car used a Lincoln engine.

Top: Leon Duray and the four-cylinder Miller engine, which Wilbur Shaw drove into second place

Next below: Frank Brisko in the four-wheel drive job

In the No. 5 car: Bill Cummings, who had the pole position

Low right: Triplett in his four-cylinder Miller



Lower left: Howdy Wilcox and the car he qualified at 117.649 m.p.h. Maurie Rose drove it in the race, as Howdy was not permitted to drive

JUST AMONG OURSELVES

The Forgotten Production Man

PROBABLY no branch of the automotive industry is less articulate than the production and manufacturing group. Consequently when we get communications from seasoned production men, voluntarily written and quite obviously expressive of long-held-back opinions, we are inclined to circulate them for the value they may have in presenting a usually unheard-from viewpoint and in stimulating thought among the rest of us.

Recently we have received several communications of just this sort—and from time to time we are planning to quote from them. One which arrived the other day points out that the production department has borne the burden of reduced prices to the consumer and expresses the belief that it has usually received too little attention both as to salary or importance in managerial councils. Then it emphasizes the need for permitting the production manager to maintain stable working forces, at least so far as key men are concerned.

"Even the brightest idea of the production man will not produce results without help," this important executive writes. "If he is lucky enough to get the machines and tools he needs, he still must have men who are interested enough in the machines to make them work. For, unless you can stand over a workman every minute, he can queer any bright idea you may have if he so desires.

"Fear of losing his job saps loyalty from the worker and increases costs. Predictions of economic improvement that do not materialize, statements by captains of industry that the depression will have good results, all fan the flame of discontent of those who are warned against the dole while they are standing in the bread line.

"Can management afford to overlook the feelings of the personnel of industry which is included in the foremen and minor production executives? I don't think so."

This same man, who is a major and not a minor executive himself, has some things to say also about the average accounting department which will be the basis for a good argument, unless we are much mistaken .... but more of that next time.

* * *

More Safety Glass Probable

BILLS compelling the use of safety glass, incidentally, were introduced and defeated in seven or more states this year while bills on the subject are pending in Illinois, New Jersey and Ohio.

The recently passed New York law makes it illegal to operate after Jan. 1, 1935, in that state any passenger vehicle manufactured after that date not equipped with safety glass wherever glass is used. A similar Michigan law takes effect July 1, 1934.

Michigan already requires safety glass in all passenger vehicles operated for hire, while Massachusetts will have a similar requirement for such vehicles after Jan. 1, 1934.

Dealers Say "Amen"

SAT in a dealer meeting the other day and heard a small group of car retailers murmur "Amen" to the idea of fewer models and reduction in the number of color and upholstery combinations. Subject came up when one of their number voiced a desire for a special model not at present in the line of the particular maker. But he was expressing a minority opinion so far as that group was concerned at least.

Plenty of other dealers have met with practical difficulty in selling a prospect the model and color available on the floor in the face of the prospect's knowledge that 50,000 other possibilities were available to satisfy his whims.

Yet many factories have persisted in multiplicity of models, apparently, to meet what they believed to be a demand on the part of dealers.

* * *

Fewer Models Next Year

WE WILL be surprised if next year doesn't see a general reduction in the number of body models per chassis so far as the industry as a whole is concerned.

Probably 80 per cent of all the cars sold today in most lines are of the five-passenger sedan and the coupe models. Any other given model comprises only a few per cent of the total output of any given maker.

Production departments have always been opposed to a great variety of models and combinations on a cost basis. Sales departments today, we think, are closer than ever before to getting around to that same viewpoint.—N.G.S.

Hanson Ames Brown, vice-president and general manager, of General Motors of Canada, under whose direction the consumer research activity was conducted.

by Norman G. Shidle

Whab

SPECIFIC, though detailed, changes in design of cars, definite modification of advertising technique, practical revision in service policies and the basis for a remarkably successful sales promotion campaign were among the major effects achieved by General Motors Products of Canada, Ltd., as a result of most thorough and scientific consumer research activity ever carried on anywhere in the automotive industry. The development of the research, together with the application of its results was directly the work of H. A. Brown, vice-president and general manager.

Having done customer research work off and on for a number of years in common with most other automobile companies, General Motors of Canada embarked on its present comprehensive and intensive effort with the mailing of more than 150,000 "picturized" questionnaires to Canadian car owners, about 20 per cent of whom sent in returns and nearly 15 per cent of whom asked for a longer and more detailed questionnaire which was offered to those who wished it. Nearly half of those who requested copies of the longer questionnaire filled it out and returned it to Oshawa for analysis.

So interesting were the questionnaires themselves that many of those who replied referred to them as being like games of "cross-word" puzzles in entertainment and attention value.

The dramatic story of this unique investigation of customer likes and dislikes divides itself naturally into three parts: (1) What the Canadian public actually said about its preferences in motor car design; (2) how General Motors of Canada, Ltd., utilized the results of the investigation in practical and specific ways; (3) the theory behind the work and its probable future.

To begin with, the entire approach of the questionnaires was chatty and informal. "We realize that many people look upon requests of this character as something of a nuisance," the brief opening page of the small questionnaire stated, adding ". . . one can hardly blame them, and yet the fact remains that these are frequently the very people whose ideas are worth the most in dictating future design.

"So this questionnaire has been developed to appeal to those who usually ignore questionnaires. It is easy to read; in fact you can get the idea without any reading and no writing is necessary unless you feel the 'urge.'

"So if you haven't time to fill it out right now, just stick it in your pocket—and maybe it will come in handy while you are waiting for dinner."

And the questionnaire itself—all included in an 8-page pamphlet—bore out the promise of this introduction, as is shown by the two sample pages reproduced herewith.

The second and larger questionnaire covered 32 pages, but was carried out in similar pictorial style and embodied a series of four "best letter" contests covering experiences in buying and using motor cars, helpful comments on advertising, helpful comments on salesmanship and helpful comments on service.

What the Public Said

The special technique used in development of the questionnaires themselves unquestionably was vital to the success of the entire program. To discount the importance of this factor would be to miss an essential element in the whole scheme.

Presence or absence of small details in car design make the dif-

The dramatic story of how General Motors of Canada sought the answer to this vital question in the most thorough and scientific consumer research activity ever carried on anywhere in the automotive industry

Does the Public Want?

ference between satisfactory and unsatisfactory motoring, the research revealed clearly, so far as Canadian car owners are concerned.

No single major engineering item was stressed frequently. Adjustable seats, type of spare wheel mounting, metal trimmings, seat cushions, ash trays — these and scores of other items, minor from the standpoint of the technician, stood out clearly as matters of real import to the average car owner. "Tremendous trifles," the General Motors of Canada executives call them, describing aptly the type of thing most mentioned.

Almost half of the items mentioned as desirable related to the comfort and convenience of the driver himself. A comfortable driver's seat was rated as one of the most important factors in selecting a car.

Adjustable front seats were rated as extremely important. Sophisticated motorists emphasized the point that it is not so much a matter of adjusting the front seat to suit their height, but of the need to change the position of the seat to get muscle and nerve relaxation in long-distance driving.

Asked to rate the general qualities most desired in a car, the Canadians voted as follows:

1. Dependability
2. Operating Economy
3. Safety
4. Comfort, Convenience
5. Ease of Control
6. Smoothness
7. Low List Price
8. Appearance
9. Pick-Up
10. Speed

Commenting on this "vote," Mr. Brown pointed out that it must be interpreted as a positive indication of what the public wants *in* an automobile—not as an indication of

Why Consumer Research?

"We, of large, modern factory organizations, can no longer maintain a close personal acquaintance with our customers and yet everything that we do at the factory is aimed directly or indirectly at serving the consumer.

"There is nothing altruistic in this viewpoint. In fact, I am frank to admit that it is the 'hard-boiled' viewpoint of the practical business man. No one is more interested in profits than we are, but we want those profits permanently assured and, whether we like it or not we know that the only way to insure this result is to serve the Canadian automobile owners the way they want to be served.

"And in order to do this we must have some means of learning about their tastes and desires, their likes and dislikes.

"We can no longer place our entire dependence on casual, personal contacts. Our business is too big and too far flung.

"We need some artificial substitute for that which existed automatically back in the days of the one man local shop.

"Customer research is nothing more than a tool that is designed to fill this growing need."—Hanson Ames Brown, vice-president and general manager of General Motors of Canada.

what it is willing to have left out. Take speed and pick-up out of the car, Mr. Brown believes, and all the dependability in the world won't sell it in modern competition.

But the clear indications of positive public preference are given in the listing.

The Canadian public shows a strong preference for dull colors—this year at least. And a major difference in color preference was developed as between the different provinces in the Dominion. Maroon has a very strong appeal, for instance, in Quebec and the Prairie provinces; sale of a green car in Quebec, on the other hand, is difficult.

Low-priced car owners showed themselves to be far more radical in their design desires than were the owners of middle and high-priced cars. A great preference for new gadgets of all kinds, for sloping radiator fronts and for V-type radiators was strongly evident among owners of the cheaper cars. A majority of those desiring flat radiator fronts were found among drivers of middle priced units.

Free-wheeling isn't too popular in Canada, particularly among those who have had long experience with it, yet a clear majority of those experienced drivers who replied to the longer questionnaire considered a synchro-mesh transmission to be absolutely essential.

Safety glass stood high among the features which Canadians rated as essential, while many of them indicated clearly a willingness to pay definitely higher prices for their cars in order to be able to have them equipped with this and other features such as dash compartments, adjustable seats, ride regulators, super balloon tires, radiator shutters, automatic chokes, etc.

In advertising and in service, as well as in design, definite public preferences were discovered. Some of the reactions as regards advertising and advertising copy were particularly interesting. But let Mr. Brown tell about them in his own words.

"One of the chief things we have found," he says, "is a full consciousness on the part of prospective buyers today as to who is paying for the huge advertising space which they see. We found a very definite reaction against too extravagant use of space.

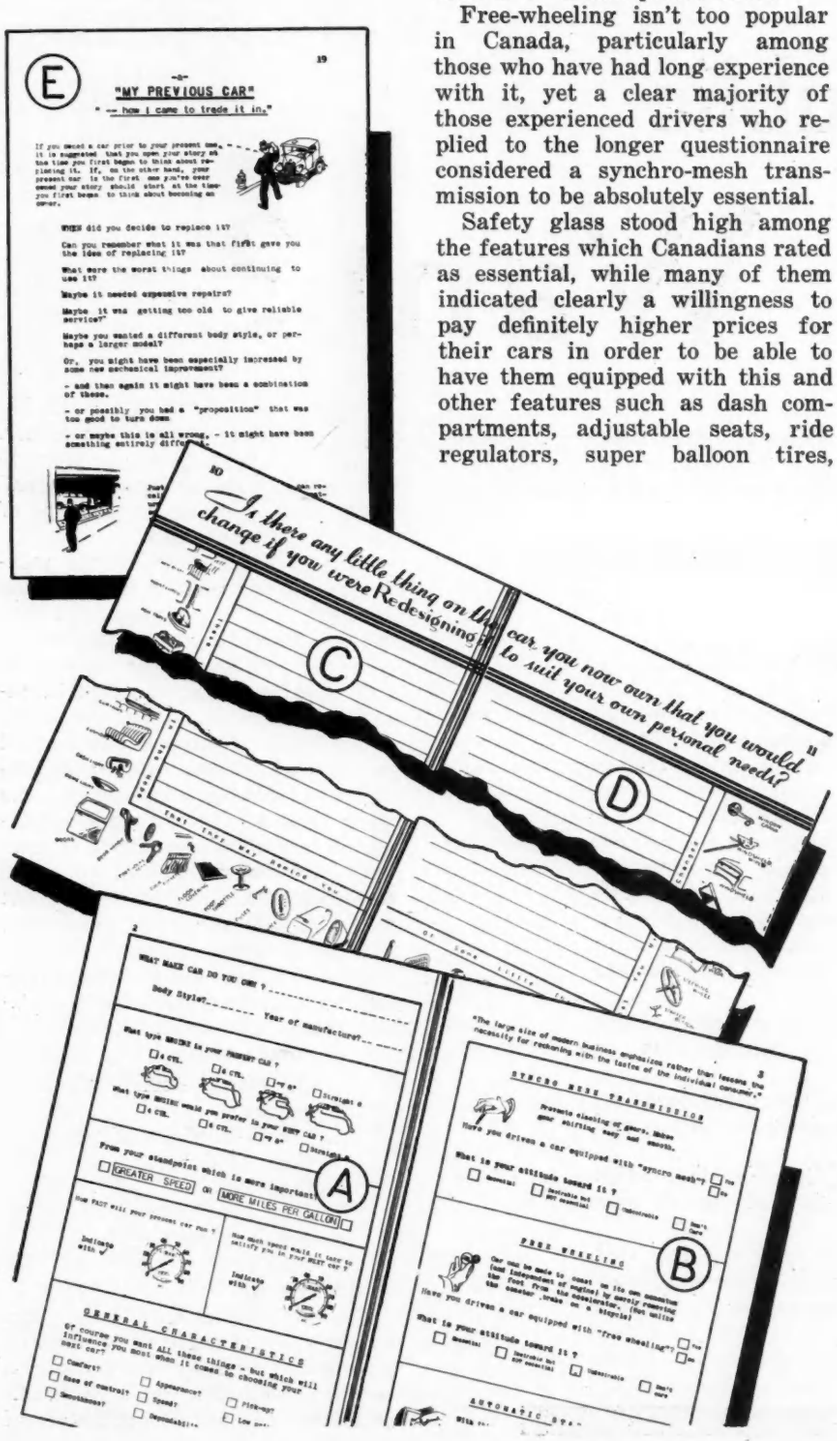
Particularly did we find the reaction unfavorable when the copy was devoted largely to generalities and superlatives. The returns indicated a clear desire on the part of the public for copy which would help it in its task of purchasing a motor car. It wants information in the advertising which will be of service.

"One might almost say that the results of our investigations indicate the need for an entirely new approach to the whole matter of automobile copy. They indicate that we should approach the matter of copy from the standpoint of reader-service, rather than from the standpoint of reader domination, as has been common in the past."

How the Results Were Used

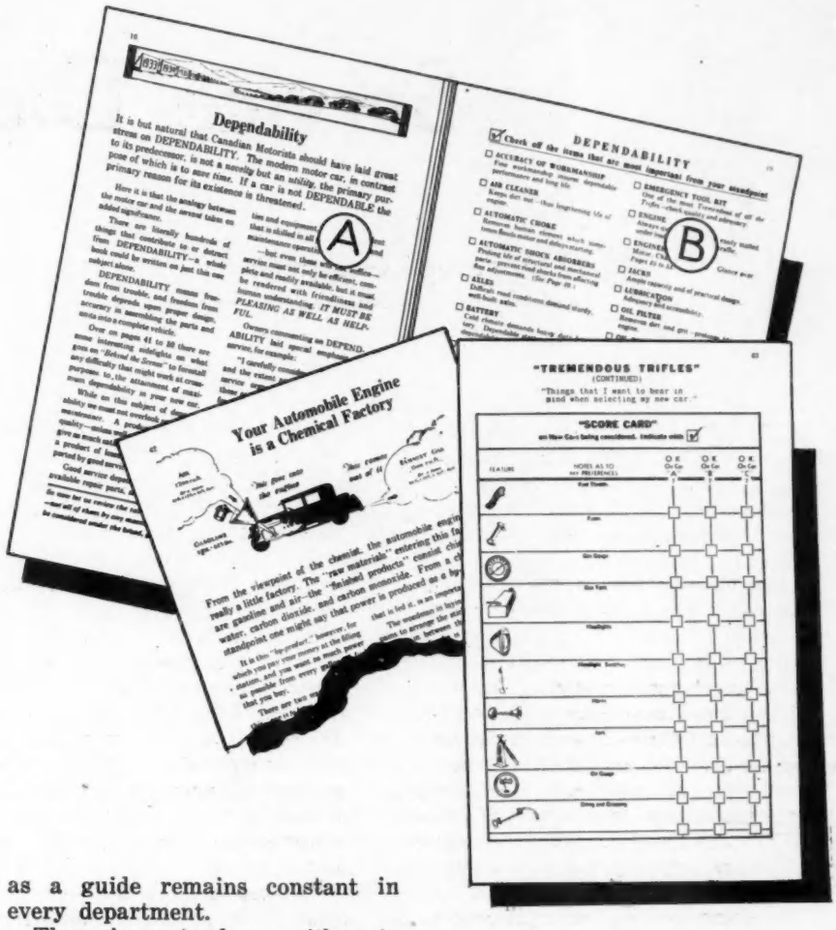
Utilization of the results of these investigations at General Motors of Canada is very definitely a management matter. It is not the specialized activity of just one department.

The whole activity heads up directly to H. A. Brown, vice-president and general manager, to whose vision and initiative, as previously noted, must be credited the practical application of the entire plan, although Mr. Brown credits H. G. Weaver, famed sales analyst of the General Motors Corporation



It was both easy and interesting to answer as these sample pages from the questionnaires suggest. A and B are from the first questionnaire of which 150,000 were mailed and about 30,000 returned. C and D are from the larger 32-page questionnaire which was mailed only on request.

A feature of the large questionnaire was a cash prize letter contest. In connection with this contest, rather comprehensive instructions were supplied to the letter-writer so that he would express opinions on the particular subjects it was desired to get information. E illustrates how cleverly these instructions were presented.



Sample pages from the "Automobile Buyer's Guide" sent to 25,000 Canadians at their own request. Spread similar to A and B, were included on dependability, economy, safety, comfort, smoothness, ease of control, low list price, appearance and performance. Other pages carried simple explanations of technical points and comprehensive check sheets for the reader to use in selecting his car.

sales staff in Detroit, with the development of the technique of the operation.

The results of the survey first were applied directly to the purpose for which they had been gathered—that of influencing the design of the Canadian-built products of General Motors. Revisions in design actually were made in the cars as a result of what was learned, with the result that the Canadian cars now differ from the U. S. products of General Motors in numerous particulars. Many particular design features now are incorporated to adapt the Canadian products very definitely to Canadian conditions as exposed by the questionnaire replies.

On the Chevrolet, for example, louvres were substituted for chromium plated doors on the hood as a result of a definite desire on the part of Canadians for a more restrained use of chromium. Larger tires and smaller wheels reflect the Canadian preference as regard super balloons; free wheeling was eliminated from the standard models; a steel plate now encloses the battery of the Canadian Chevrolets, chiefly in response to demands from Western Canada; one key instead of three or four takes care of all the locks on the car (although subsequent research now in progress indicates two keys instead of one as perhaps the final answer); metal tire covers are used on all jobs; paint and color set-ups are worked out definitely in relation to the questionnaire results and are different from those used in the U. S.; and other similar items in detail have been incorporated on various other makes in the General Motors of Canada line as a result of the consumer research replies.

The engineering and production departments, obviously, are not asked to accept blindly the suggestions of even thousands of owners. Cost, availability of material, standardization necessities and a score of other factors are considered before changes are made, but the essential value of the research as a guide remains constant in every department.

There is no tendency, either, to overestimate the possibilities of the consumer research results.

Just as much responsibility as ever rests on the engineering department for production of important technical changes. The engineers know that basic motor car development lies in realms of research and technical investigation along lines which never could come within the scope of lay thinking. They know that they always will be expected to develop fundamentals which will surprise the public. Engineering research will not abdicate to consumer research.

Probably the most evident public result of this entire customer research effort is the "Automobile Buyers' Guide" which has already been sent on request to more than 25,000 Canadians who have heard about it through magazine, newspaper and radio advertising of the Canadian unit. Described as "a book which 40,000 Canadians helped us to write," this 76-page volume is partly an analysis of the views obtained by the questionnaire last autumn. Based on the idea that the purchase of a car is a relatively big undertaking for the average person, the book discusses the various elements which are involved in dependability, operating economy, safety, comfort, ease of control, smoothness, low list price, appearance, pick-up and speed and provides check sheets by which the recipient can compare the items which he considers of importance under these heads with the general opinions of all owners as revealed by the survey.

It is written in the same casual, easy-to-read style as were the original questionnaires and encourages the prospective buyer to make something of a cross-word puzzle game of selecting his new car. It contains a minimum of General Motors promotion matter and a maximum of excellent advice to prospective buyers as regards what to check up on in making their purchase and how to analyze each of the factors.

Under the heading "Aerodynamics," this guide contains a brief, non-technical explanation of what streamlining is and what it isn't, while other pages toward the end of the volume give the laymen a simple, interesting text-book description of how an engine works,

(Turn to page 678, please)

Service Dictates Engin De

by Joseph Geschelin
Engineering Editor, Automotive Industries

CAN commercially available oils be expected to give satisfaction under all conditions so long as the limits of crankcase temperatures are not controlled?

Are blow-by and power loss inescapably linked with broad speed ranges?

Does high oil consumption call for changes in engine design?

Prominent engineers and petroleum technologists have been working on the answers to these questions as well as other pressing problems of engine design. Above the heat of the discussion comes a persistent cry for less viscous lubricants. The only valid objections seem to be increased noise and higher oil consumption.

That's where the designer comes in. Noise can be taken care of by using finer clearances—oil consumption may be controlled by other means. Some of the specific suggestions bearing on these questions form the basis for this article. The most important might be summarized as follows:

1. Need for controlling the range of crankcase temperature.
2. Need for controlling or metering the amount of lubricant fed to the bearings and cylinder walls.
3. Need for control of cylinder-head temperature.
4. Possibility of specifying less viscous oils as a result of making the foregoing design changes.
5. Need for better manufacturing control of cylinder bore dimensions, alignment and surface finish.
6. Selection of correct piston ring design, better manufacturing control of piston ring production, improved piston ring inspection.

If mechanical changes in engine design are made in the future, which will have the effect of *reducing* oil consumption, they will be made not for that reason but because of the effect of high oil consumption upon engine performance. That's the opinion of A. Ludlow Clayden. He places particular emphasis upon the necessity for controlling the volume of lubricant fed to the bearings and cylinder walls. And, in fact, makes a very strong case for the ever present need of metering the engine lubricant in proportion to the actual minimum requirements of each element.

To support this, he said in his paper[1]: "It is a safe assumption that the actual requirements of any bearing in a gasoline engine can be stated in terms of volume per revolution. In actual practice, however, the volume supplied per revolution increases as the speed increases, and for several reasons: first, the delivery of the conventional form of gear pump increases more rapidly than does the speed, although this may be offset by a release valve which will maintain a fixed pressure on the oil supply line; second, when oil is led to a bearing and the shaft rotated, the bearing itself operates as a pump and in most cases efficiency rises more rapidly than the speed; third, when connecting-rod bearings are supplied by passages drilled through the crank webs, the shaft becomes a centrifugal pump; and, finally, with increase in speed, the temperature of the oil tends to rise and the viscosity to decrease."

Talking recently with one of the important bearing manufacturers, we learned of a series of unpublished tests which show some surprising results. It was found that bearing temperatures are considerably higher than current experience might indicate, ranging around 400 deg. F. At this temperature some of the commonly-used bearing alloys are dangerously close to the melting point. A direct result of these carefully conducted tests was a change in the bearing alloy supplied to a prominent manufacturer of heavy duty truck engines. The new alloy is a leaded bronze composition which can safely stand temperatures in excess of 400 deg. Fahr.

Mr. Clayden anticipated this in his paper by the statement that, "Changes in shaft and bearing materials will probably take place, since cost is the only objection to making such changes now. With

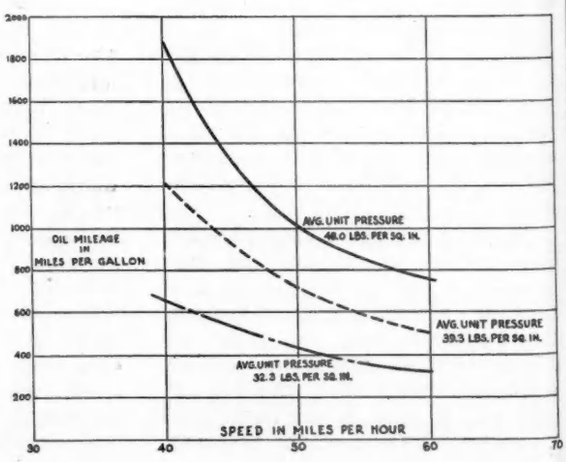


Fig. 1. The effect of increasing the unit pressure of the oil rings on oil mileage

[1] "Factors in Engine Design Which Affect Oil Performance," by A. Ludlow Clayden, A.S.T.M. Symposium on Motor Lubricants.

Design Changes

Modification in Construction Details and Production Methods Are Needed to Permit Use of Less Viscous Oils Demanded by Diverse Operating Conditions

A. Ludlow Clayden, chief engineer, gas engine research, Sun Oil Co.

bearing materials of much greater durability, it would be possible to safely reduce the oil feed because it would not be necessary to allow for very large increases in clearance due to wear."

Clayden brings up another vital point which will bear discussion pro and con. He says in part: "Undoubtedly, it is not generally realized that the operating temperature of a bearing cannot be reduced by increasing the amount of oil forced through the bearing. Of course, automobile engine bearings are to some extent oil-cooled, but it is the oil dropping out of the crankcase atmosphere running over the outside of the bearings and the parts in contact with it which does the cooling, and such cooling could be performed much better by other means. Supplying more oil or chilling the oil on its way to the bearings cannot make any sensible difference. Circulating air, oil or water around the outside of the bearings provide the only possible method for reducing their temperature."

One solution suggested by C. M. Larson, Sinclair Oil technologist, was to change the operation of the oil circulating system in the following fashion: provide a main oil reservoir in conjunction with an auxiliary reservoir containing about two quarts, both connected by a thermostatically-controlled valve. Upon starting, the small reservoir would function, thus circulating a small volume which would warm up quickly. Then the entire volume would cut in. The entire system could be worked out in conjunction with some form of oil cooler.

All-weather driving, higher engine speeds and larger engines have resulted in a gradual widening of the operating temperature range which has made it increasingly difficult for the refiner to manufacture a lubricant that will permit easy starting and yet be sufficiently viscous at high temperatures to lubricate properly. Yet the problem would be solved if the maximum temperature were lowered only 50 deg. Fahr.

The influence of atmospheric and engine temperatures on the problem may be readily seen by referring to Table 1 of seasonal variations submitted in discussion by J. C. Geniesse.

D. Geniesse suggested further that since storage battery effectiveness depreciates considerably with temperature, it bears a definite relation to the viscosity of the lubricant. For example, a battery which gives satisfactory starting capacity at 30 deg. F. with an oil of 50,000 sec. at 30 deg. F. will require oils of 30,000 and 10,000 sec. maximum viscosity at 0 deg. F. and — 30 deg. F. respectively to function properly at the lower temperatures.

Thus, for easy starting the maximum viscosities should preferably be 50,000 at 30 deg. F., 30,000 at 0 deg. F., and 10,000 at — 30 deg. F., for the three oils to be used in the classifications given above.

"The minimum viscosity permissible in the crankcase should preferably be of the order of 35-40 sec., which corresponds to 45 sec. for the undiluted oil. Thus the limiting high temperature specifications for the three oils would be a minimum viscosity of 45 sec. at 250 deg. F., 225 deg. F., and 200 deg. F. respectively.

"On this basis the minimum viscosity index permissible for ideal operation of the motor will be those listed in the last column of Table 1. It may be seen that satisfactory

Table I

Seasonal Temp. Range—Deg. F.	Crankase Temp. Range—Deg. F.	Min. V. I. for Ideal Oil
30 to 100	30 to 250	— 10
0 to 70	0 to 225	+ 75
— 30 to 40	— 30 to 200	+ 120

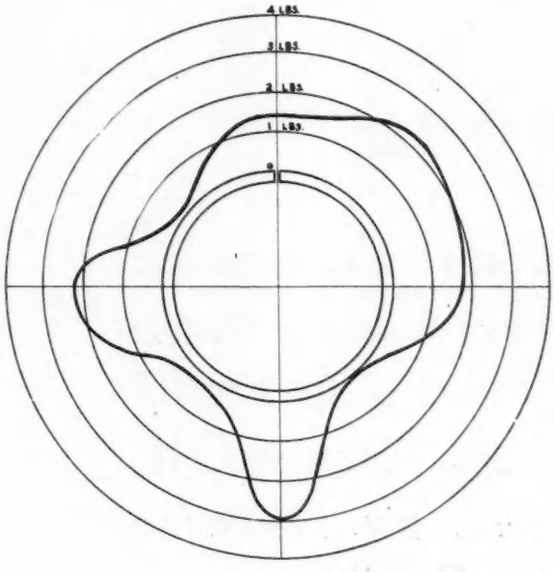


Fig. 2. Piston ring with wild and erratic distribution of unit pressures as measured by point-to-point inspection gage. This ring had satisfactorily passed the usual production inspection tests

operation in very cold weather is practically impossible with present commercial lubricating oils. However, if the maximum temperatures are lowered only 50 deg. F. it will be possible to use very low viscosity index oils in the coldest weather."

The relation of such characteristics as viscosity and volatility upon engine design came in for considerable attention on the part of many of those participating in the discussion. Clayden, for example, scored the continued discussion of the so-called evils of dilution due to contamination with fuel. He finds that the use of lubricants of extremely low viscosity is in no way dangerous since, in the average automobile engine as viscosity decreases, the volume of oil supplied to the bearings and thence to the cylinders increases. Careful tests seem to indicate that there is no measurable difference in the rate of wear over a very wide range of variations in viscosity.

Apparently the only valid objection to very low viscosity is increase in noise. Since low viscosity is usually followed by high consumption which, in turn, is followed by early replenishment, it would require very unusual circumstances of use for the acquisition of degrees of dilution which would be a serious hazard. However, automatic means of controlling engine jacket temperatures, crankcase ventilation and, more recently automatic oil temperature control, has removed dilution from the list of current problems in Mr. Clayden's opinion.

In considering the importance of viscosity in automobile engine lubrication, E. W. Upham[2] concludes that an oil which will satisfy the requirement of cold weather starting will not satisfy consumption requirement and vice versa. Until engines are changed or a far different lubricant can be produced, it seems necessary to use one range for cold weather based on starting requirements, and an entirely different range for warm weather based largely on consumption requirements. It is interesting to compare these conclusions with the recommendations of Doctor Geniesse.

Mr. Upham finds it generally accepted that under temperature conditions of 0 deg. F. an oil purchased with the maximum Saybolt viscosity of 50,000 sec. at that temperature is desirable for starting with the average engine. With the trend in manufacturing toward closer tolerances and tighter machine fits it is expected that this limiting viscosity value may be still further lowered. Experimental work points to the conclusion that it is the viscosity of oil on the cylinder walls that lowers the engine revolutions per minute under cold weather starting conditions. The oil at the bearings has very little effect.

The relation of viscosity and volatility to oil consumption was stated in very convincing fashion by W. H. Graves[4] who introduced data to show that, with other conditions fixed, oil consumption decreases with increased viscosity to some critical viscosity depending upon engine design, and then increases with increased viscosity.

The volatility of an oil is shown by Mr. Graves to effect oil consumption and, with the exception of viscosity, probably is more closely associated with oil consumption than any other property of the oil. Data are given showing that high volatility may double oil consumption, but definite conclusions are not reached because of insufficient test data and the many variables still undetermined.

When it comes to temperature effects, Gruse[3] reports that an engine running intermittently on light load at low speeds and low

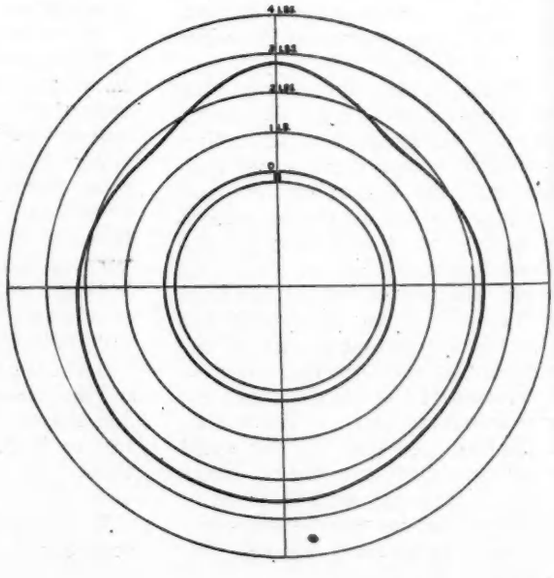


Fig. 3. Same make ring as in Fig. 2, passed same inspection tests. Better distribution of pressure is noted in this polar diagram. Note peak pressure at ring gap to resist tendency to flutter

[2] "Viscosity of Automobile Crankcase Oils as Related to Service Requirements," by E. W. Upham Chief Metallurgist, Chrysler Corp.. A.S.T.M. Symposium on Motor Lubricants.

[3] "Carbon Deposit in Gasoline Engines," by W. A. Gruse.

[4] "Oil Consumption in Motor Car Engines," by W. H. Graves, Chief Metallurgist, Packard Motor Car Co., A.S.T.M. Symposium on Motor Lubricants.

temperatures will accumulate carbon deposit much more rapidly than under severe conditions. A hard run, in fact, will partly clean out an engine carbonized under mild conditions. This is equivalent to saying that deposits accumulate rapidly at low engine temperatures and that when the temperature is raised either by itself or by raising the speed or load or both, the deposition is minimized.

In discussing this paper, T. S. Rogers of the Standard Oil of Indiana mentioned that careful tests in their laboratories indicate that carbon deposits may be controlled by low temperatures. These tests show a sensible drop in carbon deposits at very low temperatures, i. e., low as compared with ordinary running conditions.

Design Changes

In noting the things that might be done to engine design to reduce oil consumption, Graves[4] lists the following factors that have been investigated:

1. Smaller crankshaft metering reduces oil consumption somewhat.
2. Changing the location of bleed holes in the connecting rods may increase or decrease oil consumption, depending upon the amount of oil thrown on cylinder walls.
3. Piston rings of the same design but of different manufacture may show as much as 100 per cent difference in oil consumption. The more nearly true the diameter of the ring the lower the oil consumption.
4. The size of the oil ring groove on oil control rings effects oil consumption. With a larger excess of oil on cylinder walls, the deeper or larger the groove the less the oil consumption.
5. Water outlet temperature reduced from 160 deg. F. to 125 deg. F. only slightly affected oil consumption.
6. Oil temperature at pump outlet reduced from 175 deg. F. to 150 deg. F. only slightly affected oil consumption.
7. Change in oil pressure, if it changes the quantity of oil thrown on cylinder walls has an appreciable influence.

[5] "Hydraulic Action in Piston Ring Design," presented at the fourth annual conference on automotive servicing at Purdue University, March 16, 1933, by D. D. Robertson.

W. H. Graves, chief chemist and metallurgist, Packard Motor Car Co.

D. D. Robertson, chief engineer, Wilkening Mfg. Co., provided an unpublished discussion of Mr. Graves' paper amplifying a recent paper on piston ring design[5]. In the first place Robertson drew attention to the effect of piston design which includes the choice of materials, provision for heat transfer, and the arrangement and number of piston rings. In heavy duty bus service particularly, the piston material exerts a profound influence, since overheating of the head of the piston due to inadequate heat transfer will cause carbonization of the rings. Here, again, the first impulse is to blame the oil and attempt to select oils having different characteristics, whereas the problem should be solved by substituting pistons of a different design and different material.

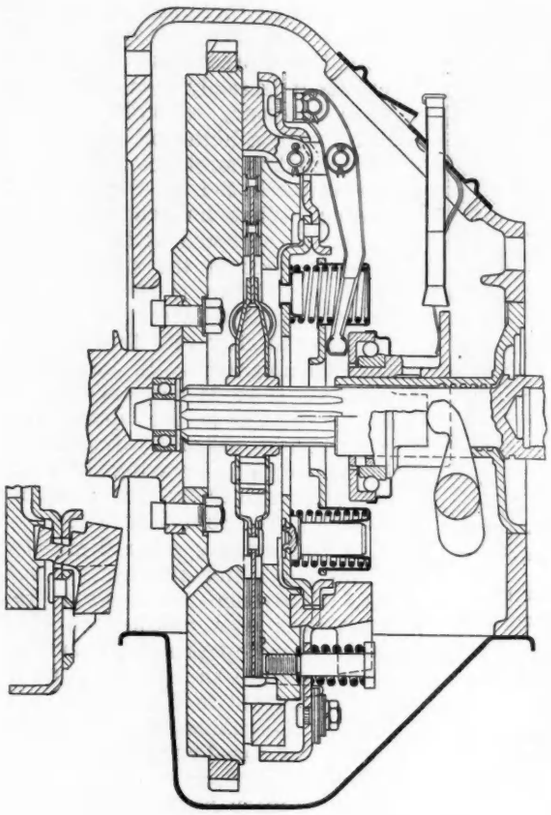
According to Mr. Robertson, blow-by as well as excessive oil consumption at high speeds are inescapably linked with the wide range of engine speed now in vogue. Within reasonable limits these conditions may be minimized if not entirely eliminated by correct piston ring design comprehending better control of manufacturing variations as well as the control of unit pressures.

However, the effectiveness of modifications is largely limited by the speed range. The effect of increasing the unit pressure of the oil rings on oil mileage is illustrated in Fig. 1, which shows the result of three tests run in the same engine under the same conditions, using three sets of oil rings of the wide channel type with different unit pressures. From these curves it is easily seen why it has been necessary to build these oil rings with a high unit pressure in order that it might be sufficient to cut through the oil film at high speeds. What happens when the engine is operated at low speeds? The pressure of the ring is fixed while the thickness of the oil film is very much reduced. The result is that the ring cuts through this thin oil film too easily and, consequently, there is not sufficient oil left to lubricate the upper ring. This causes excessive friction of the upper rings, wearing the rings and cylinder rapidly, and pounding the ring grooves out of shape.

In commenting upon discussion of oil rings and oil ring grooves, Mr. Robertson emphasized the point that *unit pressure* is relatively more important than the size of the groove in the ring. Obviously the point is that with larger grooves the contacting area of the ring is decreased and the unit pressure is increased.

Recent work by Robertson indicates not only that there is a marked difference in results between piston rings of the same design but of different manufacture, as mentioned by Mr. Graves, but that the same wide range of differences may exist in rings produced by the same manufacturer. Obviously this point is of greatest concern to the designing engineer and may easily upset his most careful calculation. These differences are well illustrated in Figs. 2 and 3 which show two rings made by the same manufacturer and selected at random from a group of rings of the same size. Both rings satisfactorily passed the usual production inspection of light-testing and load required to compress the ring. But when tested in a special inspection fixture which checks unit pressures around the periphery, the polar diagrams illustrating the result show some startling effects.

In Fig. 2 the distribution of load or pressure is wild and erratic, approaching zero values at three points, extreme peaks at two other points and a distribution of high values over a range of about 120 deg. Fig. 3 shows a much better distribution of pressures, attaining high values at the ring gap. If such variations exist to any extent, there is a definite need for better, more positive control and, probably, need for a change in routine inspection methods.



Continental Ace Models Now Equipped with CENTRIFUGAL AUTOMATIC CLUTCH

Fig. 1 — Section through Continental automatic centrifugal clutch.

A CENTRIFUGAL clutch in combination with a free-wheeling unit is now standard equipment of the Ace model produced by Continental Automobile Company. A feature of the design is a dash control which enables the change to conventional clutch operation without any automatic action, if so desired.

The clutch engages automatically and smoothly, with a small slipping period, starting at 600 r.p.m. of the engine, engagement under full engine torque being completed at 900-1000 r.p.m. When the engine is slowed down, it becomes disengaged completely at 600 r.p.m. This is accomplished by means of centrifugal weights, and the only factor that controls clutch engagement and disengagement is the engine speed.

As an illustration of the smoothness with which the clutch operates, it is stated that with it the car can be started in high gear without jerking. This is not recommended, however, on account of the rapid wear of the clutch lining which would ensue if it were practiced regularly. When used with a conventional transmission, this clutch eliminates the use of the clutch pedal at all times except momentarily when shifting from one gear to another when the car is in motion. It is not necessary to depress the clutch pedal to make a change of gear when the car is at rest and the engine is idling, because the clutch is then disengaged. With this clutch the car ordinarily can be started in second gear, and the usual method of starting and accelerating — the free-wheeling unit being assumed to be locked out—is then as follows:

After the engine has been started, the transmission is shifted into second without touching the clutch pedal. The accelerator is then depressed, the clutch engages, and the car is speeded up to a point where it is advisable to shift into high gear. The clutch pedal is then depressed, the accelerator released, and the shift into high gear is made. When it is necessary to stop, the brake is applied, and as the car comes to a stop the shift into second gear can be made without depressing the clutch pedal.

The automatic clutch functions when the control knob on the instrument board is pushed in. To push the control knob in, the clutch pedal must be depressed. When the control knob is pushed in, plunger A is forced out, and as the clutch pedal is released, the adjusting

(Turn to page 678, please)

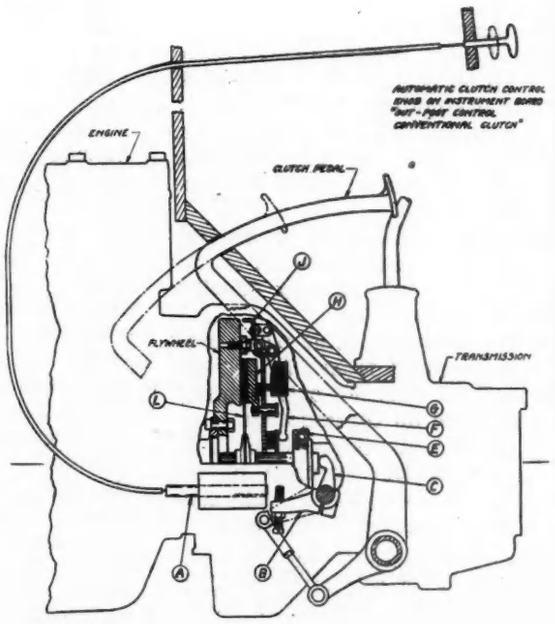


Fig. 2 — Diagram of clutch control mechanism showing it in position for foot control.

Parts Makers Maintain Strong Current Position Despite 1932's Heavy Losses

Consolidation of 33 companies shows current ratio of 8.3 and working capital of $150,220,000 after losses of $27,321,000 last year occasioned by volume and price reductions

by Don Blanchard
Editor, Automotive Industries

SUB-CELLAR prices combined with a drastic curtailment in volume, made 1932 the most unsatisfactory year financially for the industry's suppliers that they ever have experienced. The comparative analysis, presented herewith, of the four-year record of 33 parts and equipment makers shows that the combined net loss of the group last year was $27,321,000 against profits of $104,467,000 in 1929, $41,224,000 in 1930 and $7,600,000 in 1931.

Losses sustained by parts makers in the first quarter of this year, as tabulated on page 660 of May 27 *Automotive Industries*, were even larger than in the corresponding period last year. The big second-quarter upswing in volume now in progress will do much to correct this unfavorable showing. Moreover, the outlook for sales during the balance of the year now seems much rosier than it did two months ago. Nevertheless, no volume increase sufficient to put suppliers into the black at present prices appears probable this year. Consequently, despite improved sales prospects, the need for higher prices continues pressing.

33 Companies Consolidated

(000 Omitted)	1929	1930	1931	1932
Net Income after depr., Int., Taxes, etc.	$104,467	$41,224	$7,600	d$27,321
Dividends	54,689	51,327	34,060	13,045
Balance after dividends, etc.	49,789	d10,182	d26,460	d40,417
Plant & Property after depreciation	285,863	289,501	272,888	221,474
Cash & Equivalent	106,622	110,060	97,382	89,583
Receivables	60,438	42,294	33,513	24,335
Inventories	121,701	89,143	73,300	55,805
Current Assets	300,916	240,173	205,275	170,872
Current Liabilities	61,497	43,392	38,297	20,653
Current Ratio	4.9	5.5	5.4	8.3
Working Capital	239,420	196,779	166,979	150,220
Funded Debt	21,139	18,572	21,678	23,082
Capital & Surplus	584,563	556,640	522,465	395,164
Intangibles—good-will, patents, etc.	59,421	61,333	62,545	14,537
Capital & Surplus less intangibles	525,142	495,287	459,919	380,627
Per Cent Return on Capital & Surplus less Intang.	19.9	8.3	1.7	d7.2
Working Capital as Per Cent of Capital & Surplus less Intangibles	46	40	37	39

Net Income After Depreciation, Taxes, Interest, etc.

	1929	1930	1931	1932
American Chain	$3,279	$1,685	*d$2,183*	*d$2,986*
Bendix Aviation	7,417	1,251	1,555	*d1,601*
Bohn Aluminum	2,620	726	295	*d721*
Borg-Warner	6,685	2,318	1,208	*d598*
Briggs Manufacturing	2,427	4,036	684	*d1,896*
Budd Manufacturing Co., E. G.	1,534	21	*d750*	*d1,786*
Budd Wheel	1,791	1,457	183	*d1,387*
Continental Motors	711	*d2,038*	*d1,899*	*d2,764*
Campbell, Wyant & Cannon	1,279	638	191	*d313*
Eaton Mfg. Co.	1,502	1,205	243	*d674*
Electric Autolite	14,514	5,043	3,914	1,364
Electric Storage Battery	7,911	5,647	2,770	1,260
Hayes Body	*d245*	*d858*	*d880*	*d294*
Houdaille Hershey	1,519	*d157*	102	*d641*
Kelsey-Hayes	3,316	2,619	*d667*	*d3,089*
Lycoming	713	*d586*	1,240	*d456*
Marlin-Rockwell	2,707	922	*d23*	*d123*
Midland Steel Products	2,555	1,272	776	*d221*
Motor Products	2,141	487	*d18*	*d518*
Motor Wheel	3,480	987	*d572*	*d1,187*
McCord Radiator	618	11	*d284*	*d649*
Mullins Manufacturing	477	11	100	*d696*
Murray Corporation	1,308	234	*d1,241*	*d1,881*
Raybestos-Manhattan	3,206	1,157	554	*d457*
Reynolds Spring	115	*d182*	*d195*	*d198*
Ross Gear & Tool	566	336	246	124
Spicer Manufacturing Co.	2,120	40	*d1,016*	*d1,414*
Stewart-Warner	6,839	1,262	*d1,850*	*d3,445*
Thompson Products	1,231	106	*d107*	*d182*
Timken-Detroit Axle	1,513	842	328	*d1,194*
Timken Roller Bearing	14,155	7,524	2,571	*d483*
Trico Products	2,250	1,908	1,763	965
L. A. Young	2,213	1,295	522	*d196*
Total	$104,467	$41,224	$7,600	*d$27,321*

(000 omitted)

If pending Federal legislation does increase costs, as it is expected to do, higher prices in the third and fourth quarters will be a necessary consequence. Certainly it is to be hoped that they will be enough higher to add something to the present meager margins of gross profit available to the suppliers.

There was nothing spotty about the devastating effects of conditions prevailing last year. Only four companies in the group operated in the black as contrasted with 19 in 1931. After dividends and other charges, only one company had any balance to transfer to surplus last year. These facts demonstrate that the suppliers as a group were unable to cope successfully with the situation and that the unsatisfactory showing of the group was not due to heavy losses of a few companies.

Despite three years of adversity, the current position of the suppliers continues exceptionally strong, which is a tribute to the financial acumen of their executives. The ratio of current assets to current liabilities was 8.3 at the end of 1932 as compared with only

	Dividends				Balance to Surplus after Dividends, Charges etc.				Plant and Property after Depreciation			
	1929	1930	1931	1932	1929	1930	1931	1932	1929	1930	1931	1932
American Chain	$935	$1,471	$1,008	.....	$2,344	$214	*d$3,191*	*d$2,986*	$13,136	$13,453	$12,614	$11,758
Bendix Aviation	3,126	3,608	2,097	$315	4,290	*d2,424*	*d541*	*d1,916*	7,985	11,945	11,486	10,196
Bohn Aluminum	1,580	793	529	.....	1,040	*d67*	*d283*	*d721*	5,115	5,162	5,029	2,693
Borg-Warner	4,365	3,609	1,461	530	2,319	*d1,291*	*d253*	*d1,189*	17,545	18,394	17,665	15,750
Briggs Manufacturing	.....	1,002	2,994	490	2,427	3,034	*d2,310*	*d2,586*	20,446	21,417	19,901	11,039
Budd Manufacturing Co., E. G.	1,566	1,218	.....	.....	*d32*	*d1,197*	*d730*	*d1,854*	14,142	13,578	15,055	12,455
Budd Wheel	577	1,094	808	29	1,214	353	*d625*	*d1,416*	2,643	2,839	2,888	2,466
Continental Motors	1,620	.....	.....	.....	*d909*	*d2,038*	*d1,899*	*d2,754*	16,004	12,587	11,840	11,099
Campbell, Wyant & Cannon	663	738	343	.....	616	*d100*	*d152*	*d315*	3,875	3,875	3,573	3,363
Eaton Mfg. Co.	894	1,479	743	82	609	*d275*	*d500*	*d756*	7,943	10,908	7,720	7,476
Electric Autolite	5,694	5,872	4,767	1,987	8,821	*d829*	*d854*	*d623*	11,280	12,555	11,304	8,238
Electric Storage Battery	4,542	4,579	4,013	2,198	3,369	1,068	*d1,243*	*d938*	13,018	12,455	11,497	10,715
Hayes Body	.....	.....	.....	.....	*d245*	*d853*	*d880*	*d294*	3,661	3,361	3,137	2,263
Houdaille Hershey	1,080	856	436	108	438	*d1,013*	*d334*	*d748*	4,635	4,846	7,344	7,104
Kelsey-Hayes	1,556	1,743	496	.....	1,761	876	*d1,163*	*d3,089*	13,095	16,488	15,790	8,495
Lycoming	81	70	81	75	632	*d657*	1,159	*d531*	2,865	3,289	3,488	3,335
Marlin-Rockwell	2,182	2,003	728	308	526	*d1,081*	*d751*	*d431*	2,599	2,463	2,099	1,856
Midland Steel Products	1,637	1,660	1,597	759	918	*d388*	*d821*	*d981*	6,014	5,734	5,377	4,933
Motor Products	2,079	392	388	286	62	95	*d406*	*d804*	4,364	4,153	3,918	3,647
Motor Wheel	1,985	2,480	839	.....	1,495	*d1,494*	*d1,411*	*d1,187*	7,230	7,052	6,693	6,273
McCord Radiator	[1]332	[1]294	[1]61	.....	296	*d283*	*d345*	*d649*	4,140	3,526	3,175	2,732
Mullins Manufacturing	210	206	151	.....	267	*d195*	*d51*	*d696*	4,434	4,578	4,980	3,235
Murray Corporation	827	17	17	16	481	217	*d1,258*	*d1,897*	20,790	20,123	19,869	10,099
Raybestos-Manhattan	1,538	1,728	1,389	453	1,668	*d571*	*d335*	*d911*	7,543	7,401	7,014	6,769
Reynolds Spring	.....	.....	.....	.....	115	*d182*	*d195*	*d192*	3,880	1,806	1,760	1,721
Ross Gear & Tool	360	375	[1]270	[1]225	206	*d39*	*d24*	*d101*	1,599	1,521	1,402	1,310
Spicer Manufacturing Co.	300	300	280	264	1,820	*d260*	*d1,295*	*d1,678*	8,807	7,885	6,785	4,652
Stewart-Warner	4,178	2,750	.....	.....	2,661	*d1,488*	*d1,830*	*d2,445*	17,211	16,759	12,411	11,794
Thompson Products	606	654	[1]336	[1]85	625	*d548*	*d443*	*d267*	3,298	3,445	3,498	3,459
Timken-Detroit Axle	1,017	996	388	194	496	*d154*	*d60*	*d1,388*	7,730	7,761	7,491	6,819
Timken Roller Bearing	7,223	7,236	6,029	3,316	6,932	288	*d3,458*	*d3,799*	23,207	22,647	20,715	18,769
Trico Products	834	937	937	937	1,416	971	825	27	1,601	1,586	1,655	1,606
L. A. Young	1,102	1,167	874	388	1,111	129	*d353*	*d584*	4,028	3,909	3,715	3,355
Total	$54,689	$51,327	$34,060	$13,045	$49,789	*d$10,182*	*d$26,460*	*d$40,417*	$285,863	$289,501	$272,888	$221,474

(000 Omitted)

	Good Will, Patents, etc.				Cash and Securities				Receivables			
	1929	1930	1931	1932	1929	1930	1931	1932	1929	1930	1931	1932
American Chain	$2,649	$2,429	$1,899	$832	$969	$1,582	$996	$1,403	$5,862	$4,381	$2,759	$1,902
Bendix Aviation	33,281	36,672	36,801	.....	8,132	4,761	3,941	3,537	2,331	2,269	1,870	1,344
Bohn Aluminum	181	150	134	124	2,948	1,178	460	483	1,242	913	683	475
Borg-Warner	679	546	465	421	8,401	7,199	7,175	7,493	3,188	2,270	2,337	1,269
Briggs Manufacturing	.....	.....	.....	.....	2,324	12,859	7,540	6,691	5,893	1,339	760	1,294
Budd Manufacturing Co., E. G.	295	197	219	.....	2,255	1,656	402	757	1,877	1,870	1,997	1,613
Budd Wheel	1,284	1,284	1,334	1,334	588	1,411	524	105	968	986	749	225
Continental Motors	5,908	5,908	5,908	5,908	3,444	3,277	2,731	1,309	1,817	702	437	368
Campbell, Wyant & Cannon	.....	.....	.....	.....	569	831	790	770	484	353	196	143
Eaton Mfg. Co.	337	298	282	271	1,212	2,261	2,562	2,030	1,034	1,118	840	689
Electric Autolite	.....	.....	.....	.....	10,527	2,615	1,994	918	3,983	3,037	2,165	1,742
Electric Storage Battery	.....	.....	.....	.....	9,734	13,224	14,983	16,190	7,217	5,841	4,331	3,297
Hayes Body	.....	.....	.....	.....	223	137	16	11	605	762	390	142
Houdaille Hershey	.....	.....	.....	.....	1,997	1,586	1,927	2,038	687	405	368	237
Kelsey-Hayes	9,543	9,543	9,543	.....	726	1,727	632	1,071	1,410	1,390	1,273	704
Lycoming	.....	.....	.....	.....	216	144	79	134	666	497	297	219
Marlin-Rockwell	.....	.....	.....	.....	5,832	4,879	3,834	3,521	432	210	180	140
Midland Steel Products	1,675	1,675	1,675	1,916	7,363	6,837	6,096	4,907	1,010	682	495	770
Motor Products	.....	.....	.....	.....	3,048	3,276	2,950	2,060	517	391	328	329
Motor Wheel	.....	.....	.....	.....	3,960	2,547	1,996	1,537	994	823	534	586
McCord Radiator	.....	.....	.....	.....	316	360	156	104	1,067	680	430	341
Mullins Manufacturing	86	89	94	14	441	139	427	84	470	701	811	214
Murray Corporation	301	301	296	.....	1,617	3,285	3,358	2,965	2,528	758	634	731
Raybestos-Manhattan	595	595	595	595	3,472	3,306	3,164	3,325	1,732	1,496	1,254	1,019
Reynolds Spring	734	.....	.....	.....	122	76	23	5	491	316	196	16
Ross Gear & Tool	.....	.....	.....	.....	606	614	768	755	145	139	119	42
Spicer Manufacturing Co.	209	188	174	.....	704	974	693	1,122	1,217	952	711	293
Stewart-Warner	.....	.....	.....	.....	3,039	4,537	4,649	2,851	4,082	2,373	1,733	1,168
Thompson Products	834	833	830	827	740	349	155	162	698	459	518	356
Timken-Detroit Axle	.....	.....	1,684	1,684	3,680	3,401	3,487	3,050	1,763	1,653	1,922	1,255
Timken Roller Bearing	.....	.....	.....	.....	13,615	14,547	14,037	13,556	1,963	1,376	1,087	551
Trico Products	351	350	337	336	1,620	2,940	3,459	3,700	691	576	519	389
L. A. Young	479	275	275	275	2,182	1,545	1,378	939	1,074	576	590	472
Total	$59,421	$61,333	$62,545	$14,537	$106,622	$110,060	$97,382	$89,583	$60,438	$42,294	$33,513	$24,335

(000 Omitted)

[1]Not reported. Calculated from outstanding shares and dividend rates.
a Includes dies, jigs, etc., billed. * Includes special die account. [1] Includes patterns, dies, etc.
† Excess of current liabilities over current assets. * Includes purchase money mortgage.

4.9 in 1929. Cash and equivalent has been maintained at a high point, being $89,583,000, representing a relatively small drop from 1929, when this total was $106,622,000. Working capital has contracted rather sharply since 1929, having decreased 37 per cent to $150,220,000, but as the current ratios just cited prove, the working position is plenty strong in relation to the requirements of present volume levels. The analysis shows further that of the capital and surplus, less intangibles of this group of companies, working capital represented 39 per cent at the end of last year as compared with 46 per cent in 1929.

Due to operating deficits, write-offs, payment of unearned dividends in some cases and the elimination of intangible items from the balance sheet, the net worth of the group as represented by the total of capital stock and surplus after deduction of intangibles, has declined from $525,142,000 at the end of 1929 to $380,627,000 at the close of last year. Accumulated deficits after dividends during the period amount to about $87,000,000. Plant and property has been depreciated approximately $64,000,000, and about $45,000,000 of intangibles have been eliminated from the balance sheets of the group.

	Inventories				Current Assets				Current Liabilities			
	1929	1930	1931	1932	1929	1930	1931	1932	1929	1930	1931	1932
American Chain	$7,596	$7,778	$6,418	$4,646	$14,427	$13,740	$10,173	$7,950	$1,826	$1,278	$778	$610
Bendix Aviation	5,239	4,754	3,993	3,066	25,573	12,883	9,803	7,947	3,542	2,569	2,142	1,340
Bohn Aluminum	2,212	3,467	3,785	2,977	6,450	5,610	4,987	4,298	1,375	581	325	223
Borg-Warner	7,632	5,725	5,046	3,877	19,222	15,194	14,645	12,674	4,392	2,629	2,781	1,118
Briggs Manufacturing	a9,867	a4,660	a5,232	a5,539	18,084	18,858	13,532	13,525	5,454	3,526	2,503	1,909
Budd Manufacturing Co., E. G.	4,665	2,314	1,502	1,069	8,797	5,840	3,901	3,439	1,848	597	1,902	2,497
Budd Wheel	1,755	1,465	1,137	883	3,311	3,862	2,410	1,213	1,212	1,168	625	519
Continental Motors	4,794	3,050	2,485	1,703	11,095	7,029	5,653	3,382	1,293	598	496	381
Campbell, Wyant & Cannon	817	299	296	209	1,870	1,483	1,281	1,122	502	208	207	136
Eaton Mfg. Co.	2,298	2,650	2,451	1,797	4,544	6,029	6,180	4,516	1,304	1,177	900	605
Electric Autolite	4,366	3,144	2,510	1,954	18,876	8,797	6,669	4,614	4,784	2,562	1,488	1,018
Electric Storage Battery	7,576	6,589	4,692	3,492	24,567	25,696	24,068	23,111	2,633	1,999	1,110	822
Hayes Body	1,951	567	232	179	2,818	1,510	642	341	1,072	295	179	277
Houdaille Hershey	1,756	798	726	723	4,441	2,789	3,048	3,033	1,001	264	413	379
Kelsey-Hayes	4,325	3,468	3,298	1,075	6,460	7,132	5,268	2,926	3,580	9,480	11,173	1,152
Lycoming	2,118	1,582	1,541	1,566	3,033	2,336	1,918	1,920	1,084	1,808	350	90
Marlin-Rockwell	1,646	1,123	730	602	7,910	6,212	4,744	4,263	1,800	1,380	242	118
Midland Steel Products	1,132	867	809	643	9,505	8,386	7,401	6,321	1,431	900	612	239
Motor Products	1,210	851	659	524	4,775	4,518	3,938	2,913	1,043	384	323	285
Motor Wheel	2,821	1,884	1,489	1,144	7,775	5,255	4,019	3,266	1,091	651	1,036	1,438
McCord Radiator	1,208	768	715	414	2,592	1,808	1,301	860	560	168	277	258
Mullins Manufacturing	1,750	1,136	1,269	*861	2,661	1,975	2,507	1,159	225	249	1,271	581
Murray Corporation	4,630	4,159	[3]3,296	[2]2,186	9,074	8,201	7,288	5,883	2,271	1,148	873	581
Raybestos-Manhattan	4,759	3,511	2,326	1,933	9,963	8,312	6,745	6,278	1,143	533	349	313
Reynolds Spring	1,782	302	259	216	3,313	695	479	337	1,191	101	235	297
Ross Gear & Tool	366	276	193	131	1,117	1,029	1,081	928	323	188	167	46
Spicer Manufacturing Co.	4,328	2,575	1,627	610	6,249	4,501	3,031	2,025	2,504	715	696	418
Stewart-Warner	7,771	4,453	2,869	2,194	14,892	11,363	9,251	6,213	2,773	1,471	948	783
Thompson Products	1,995	1,096	765	809	3,433	1,904	1,437	1,327	1,483	517	496	522
Timken-Detroit Axle	4,788	3,393	3,248	2,634	10,231	5,055	8,658	6,940	1,538	510	1,095	279
Timken Roller Bearing	10,676	8,708	6,292	4,927	26,254	24,631	21,487	19,056	3,694	2,295	1,144	512
Trico Products	668	708	606	451	3,054	4,308	4,944	4,896	846	806	759	615
L. A. Young	1,204	1,023	804	771	4,550	3,232	2,786	2,196	679	637	402	292
Total	$121,701	$89,143	$73,300	$55,805	$300,916	$240,173	$205,275	$170,872	$61,497	$43,392	$38,297	$20,653

(000 Omitted)

	Working Capital				Funded Debt Bonds, Debentures and Mortgages				Capital and Surplus			
	1929	1930	1931	1932	1929	1930	1931	1932	1929	1930	1931	1932
American Chain	$12,601	$12,463	$9,395	$7,340	$5,200	$4,522	$4,194	$3,844	$22,468	$22,446	$18,680	$15,701
Bendix Aviation	22,031	10,314	7,661	6,607	101	420	611	432	63,513	61,787	61,590	21,666
Bohn Aluminum	5,076	5,029	4,662	4,076	1,902	1,902	1,875	1,767	8,637	8,513	8,273	5,434
Borg-Warner	14,830	12,565	11,864	11,556	1,909	1,819	1,601	1,586	32,278	31,283	30,551	28,256
Briggs Manufacturing	12,630	15,332	11,029	11,615	.....	.....	.....	.....	32,530	35,564	32,990	22,895
Budd Manufacturing Co., E. G.	6,949	5,242	1,999	942	*3,177	*2,794	*5,923	*2,912	22,343	20,761	19,488	13,456
Budd Wheel	2,099	2,693	1,785	695	.....	.....	.....	.....	6,774	7,644	6,877	5,138
Continental Motors	9,802	6,431	5,157	3,001	.....	.....	.....	.....	33,136	25,720	23,820	21,066
Campbell, Wyant & Cannon	1,369	1,275	1,075	986	.....	.....	.....	.....	5,653	5,553	5,399	5,085
Eaton Mfg. Co.	3,240	4,852	5,279	3,911	750	750	750	.....	11,085	13,999	11,864	11,169
Electric Autolite	14,092	6,235	5,180	3,596	.....	.....	.....	.....	26,021	22,230	21,045	14,708
Electric Storage Battery	21,933	23,698	22,958	22,289	.....	.....	.....	.....	37,013	38,168	36,519	35,355
Hayes Body	1,746	1,215	462	64	.....	.....	.....	.....	5,532	4,560	3,680	2,734
Houdaille Hershey	3,439	2,525	2,635	2,654	.....	.....	.....	.....	8,974	7,957	10,236	9,381
Kelsey-Hayes	2,880	†2,348	†5,905	1,774	.....	.....	.....	652	26,505	23,523	22,347	6,571
Lycoming	1,948	528	1,568	1,830	512	397	359	131	4,200	3,492	4,458	3,899
Marlin-Rockwell	6,109	4,832	4,502	4,145	.....	.....	.....	.....	8,943	7,921	7,209	6,735
Midland Steel Products	8,074	7,486	6,789	6,082	.....	.....	.....	.....	15,238	14,896	14,075	13,494
Motor Products	3,733	4,134	3,615	2,628	.....	.....	.....	.....	7,996	8,141	7,605	6,343
Motor Wheel	6,684	3,604	2,983	1,828	.....	.....	.....	.....	14,932	13,502	11,028	9,036
McCord Radiator	2,032	1,640	1,025	602	2,395	2,243	2,039	2,005	4,317	2,932	2,576	2,182
Mullins Manufacturing	2,436	1,726	1,236	577	.....	.....	.....	.....	7,353	6,499	6,443	4,004
Murray Corporation	6,803	7,054	6,415	5,301	3,185	2,860	2,500	2,250	24,864	24,458	23,633	12,674
Raybestos-Manhattan	8,819	7,779	6,396	5,965	.....	.....	.....	.....	17,879	17,293	15,876	14,966
Reynolds Spring	2,123	594	245	40	1,331	450	450	450	5,662	1,949	1,648	1,455
Ross Gear & Tool	793	841	914	883	.....	.....	.....	.....	2,463	2,435	2,420	2,353
Spicer Manufacturing Co.	3,746	3,786	2,335	1,608	.....	.....	.....	.....	13,369	13,010	11,589	8,211
Stewart-Warner	12,119	9,892	8,303	5,430	.....	.....	.....	.....	30,667	26,929	20,696	17,183
Thompson Products	1,951	1,387	941	805	.....	.....	.....	.....	6,522	5,946	5,494	5,245
Timken-Detroit Axle	8,693	4,545	7,563	6,661	.....	.....	1,062	940	17,851	16,830	16,687	15,299
Timken Roller Bearing	22,560	22,335	20,343	18,544	.....	.....	.....	.....	46,458	46,782	43,305	39,506
Trico Products	2,209	3,501	4,186	4,281	35	.....	.....	.....	4,703	5,669	6,494	6,522
L. A. Young	3,871	2,594	2,384	1,904	642	415	314	223	8,684	8,248	7,870	7,102
Total	$239,420	$196,779	$166,979	$150,220	$21,139	$18,572	$21,678	$23,082	$584,563	$556,640	$522,465	$395,164

(000 Omitted)

[1]Not reported. Calculated from outstanding shares and dividend rates.
a Includes dies, jigs, etc., billed. * Includes special die account. [1] Includes patterns, dies, etc.
† Excess of current liabilities over current assets. * Includes purchase money mortgage.

What Does the Public Want?

(Continued from page 669)

what the crankshaft is all about, what makes the car run and so forth.

The company has been completely honest with the public throughout this whole customer research program. That is one of the big reasons for its success. The company really wanted to find out the likes and dislikes of Canadians as regards automobiles. The investigations were fact-seeking projects, not sales promotion efforts—though sales promotion opportunities came as important by-products, just as did ideas for improving other phases of the business as well as the products themselves.

But there was no sales follow-up to the questionnaire. People weren't even asked to sign their names when they replied. No salesmen came after the questionnaire. No merchandising solicitation followed. The consumer research was a sincere piece of commercial, scientific investigation.

"The Automobile Buyers' Guide" is just as sincere an effort at consumer service, but is frankly designed as a subtle sales tool. Salesmen do call later on those to whom this book has been sent. And one of the important things the book has done has been to put salesmen on their toes as they never were before.

Salesmen who have followed up on recipients of the Guide are the best witnesses to the reader interest the booklet has generated. They are finding these prospects full of new questions; eager for information on elements of the car hitherto given little attention. They are finding, too, that these prospects know a lot of the answers.

And, in the early days of this follow-up work, more than one salesman came out second best in breadth of knowledge and volume of information about even some of the automobiles he himself was selling.

Energized by this practical need for complete familiarity with the cars they were selling and with the reasons behind the various features of design, the salesmen have utilized eargerly the crisply written, fact-packed booklets which General Motors of Canada now supplies them, giving the answers—so far as General Motors products are concerned—to the questions generated by the Buyers' Guide.

Salesmen undoubtedly have been made more alert and are reaching for informative literature about the cars where previously, like most retail salesmen, efforts to make them study such data were far from being uniformly successful.

Mr. Brown and the rest of the General Motors of Canada organization contemplate continued regular use of this tool. Questionnaires designed to get new reactions in time to help in design of 1934 models are being planned now.

Continental Ace Models Equipped With Automatic Clutch

(Continued from page 674)

screw on lever B catches on plunger A, holding clutch-release bearing E forward through clutch-release yoke C. When clutch-release bearing E is held in this forward position, about half the foot-control travel, the entire clutch mechanism is in automatic control. Clutch throwout lever F is now contacting release bearing E at the inner end. The outer end of this lever is fastened to reaction plate J and pivoted through a link to the flywheel ring, which latter is rigidly bolted to the engine flywheel.

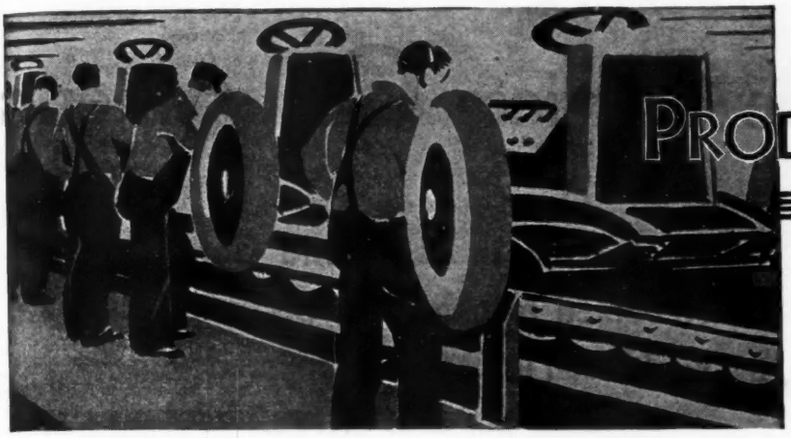
From the foregoing it is apparent that any movement of clutch throwout lever F is transmitted to the reaction plate J through the link, and clutch-throwout lever F remains stationary. Reaction plate J is also held stationary. At the bottom of the centrifugal weight G there is a rectangular-shaped foot which is clamped between reaction plate J and pressure plate H by hold-back spring. As the engine speed increases beyond 600 r.p.m., the centrifugal weight G tips slowly outward, and through its rectangular-shaped foot it overcomes the pressure of the hold-back spring, thereby separating reaction plate J and pressure plate H. Reaction plate J is held stationary by throwout lever F pressing against release bearing E. Therefore, only pressure plate H can move, and it is forced forward, thereby clamping clutch-driven plate L between it and the flywheel and taking up the drive, which occurs at about 900 r.p.m.

After pressure plate H has been clamped solid to driven disk L, centrifugal weight G can still tip a certain amount. Since pressure plate H is now clamped solid, this extra tipping of the centrifugal weight G forces reaction plate J back, with the result that the link presses throwout lever F against clutch-spring plate and spring. A gap is thus formed between throwout lever F and release bearing E, hence the bearing does not run after the car starts.

The clutch can be operated by pedal in the conventional way after the control knob on the dashboard has been pulled out. As shown in Fig. 2, plunger A is then pulled back, which allows lever B to pass by it and release bearing E to return to the free position through release yoke C. This places throwout lever F and reaction plate J in the free position. If the centrifugal weight G now tips outward, the only effect is to separate reaction plate J and pressure plate H, and as both are so far away from the flywheel, the driven disk L will not be clamped. Therefore, the automatic feature is rendered nonactive, and the clutch operates like a conventional foot-operated one.

Belgium Increases Duty on Automobiles

THE new, increased duties having gone into effect in Belgium, the quota restrictions on automobile imports, which have been in effect since August last, have been discontinued.



PRODUCTION LINES

Research Pays

J. E. Hayes, pres., The New Jersey Zinc Co., leads off a brief series showing how coordinated research is helping various industries to keep abreast of customer requirements. The first article appears in the *Executives Service Bulletin* for April. Mr. Hayes describes how his organization does it through a coordination of fundamental, commercial, and merchandizing research. He shows how this activity has made possible a great advance in the art of zinc die casting, one of the most important developments in the automotive industry. Well worth reading if you are scrutinizing the value of your own research activity.

Page Vizetelly

KIP was a term much discussed at the last annual meeting of the A. W. S. Not the word defined as "the untanned skin of a calf," but meaning a unit of 1000 lb. to certain engineers. It seems to be an old term but not well known. The idea is that instead of saying 35,000 lb./sq. in., you might save something by writing it as 35 kips/sq. in. Heard of it?

Making Diesels

Was treated to an unusual experience the other day. Through the courtesy of one on our friends, we were taken around a plant which is being groomed for the production of a wide line of diesel engines. It's in the growing stages at present but the few pieces of equipment already installed give promise of worth-while achievement. They're mighty proud of a new P & W jig borer which is a rather versatile tool with the attachments they have provided. Then there's a Niles crankpin lathe with clamshell turning fixtures for finishing two pins at a time. This baby handles pins as big around as a Ford engine. Some time soon maybe we can tell you more about this plant and what it does. For the present it's a secret.

Honing Splines

According to *The Automobile Engineer* (Eng.) for April, 1933, Clement Talbot, Ltd., has patented a novel method for honing internal splines. The honing tool has as many abrasive sticks as the number of splines. The hone is reciprocated vertically as is customary but the work is also moved back and forward in synchronism. Thus, as the tool comes down the abrasive action bears on one side, while at the return stroke the other side of the spline comes into contact. The operation takes from 5 to 15 min. depending upon the amount of stock to be removed.

Welding Advances

A list of some 160 concerns using welding in the manufacture of their products was given in a recent paper by Robert E. Kinkead read at the Conference on Re-Engineering for Economical Production at the Case School of Applied Science. If you want more details ask for "Influence of Welding on Design and Production."

Budget Tip

Heard at a recent management round table—the starting point for setting up a budget control should be the desired net profit margin. This will determine roughly the expense that may be permitted in making an estimated sales quota. Changes can then be made in various expense items to effect the hoped-for balance between income and expense.

Social Trends

At the recent annual general management conference of the A.M.A., Prof. A. H. Williams of the Wharton School, U. of P., said that the changing relations between industry and government indicate a necessity for greater control over the economic system and willingness on the part of the law to permit experimentation and change in the system. He foresees a greater participation of government in business, although the mutual relations are expected to be very flexible. Among other things, Professor Williams sees a need for: (a) Compulsory setting-up of trade associations to control each industry, (b) establishment of compulsory systems of accounting and the publication of statistics within each industry, (c) publication of operating statements at stated times.

Many Burs

Pratt & Whitney has just issued a bang-up treatise on the applications of their line of Keller Burs. Variety in profusion—mill cut, file cut, hand cut, and br-r-r- dental cut. Tool designers and production men will find this hand-book of great interest.

Plenty Talk

The more we get around to technical meetings the more we feel that investigators, particularly of the academic type, should be cautious as to the social implications of their theses. What with social trends and sweeping changes in the air, it is important to have both feet on the ground when talking about wages, unemployment insurance, old age pension, etc. If the discussion isn't clear-cut and based upon accurate facts, and relating specifically to unique examples, a perfectly good technical discussion may arouse some alert politician to the need for another perfectly bad law.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Trade Barriers Cut America's Sha

Production in U. S. and Canada amounted to only 72.4 per cent of world total in 1932 as compared with 88.3 per cent in 1929

WORLD production of automobiles in 1932 totalled 1,979,251, a decrease of 1,069,397 units, or 35.1 per cent from the 1931 output of 3,048,648 which was, in turn, roughly 26 per cent below the 1930 figure. By far the major part of the decline in total automobile production in 1932 was attributable to the decrease of 1,040,865 united in combined United States and Canadian output. The United States-Canadian share of world production in 1932 was 72.4 per cent as compared with 81.1 per cent in 1931, the difference representing, of course, the greater proportion of the total, which was accounted for by European manufacturers. All of the major automobile manufacturing countries, except the United Kingdom, registered decreases during the year and only five countries showed increases according to the reports from which this study was prepared and which represented the best information available in the 17 automobile producing countries.

In the American industry, as well as abroad, automobile manufacturing in 1932 was centered more than ever around the production of small, low-priced models to fit the reduced public pocketbook. In all of the leading European manufacturing countries this resulted in an increased output of four and six cylinder cars while in the United States competition in the low price class was greatly heightened by the appearance of new models in this field. In fact, this development here and abroad is probably the most significant factor in the industry and has created a problem for companies which are not represented in the minimum-price market.

As success in that market is based upon a low profit margin and a large turn-over, many smaller foreign companies have found it difficult to participate successfully in the relatively greater trade in the less expensive models. There is, of coures, throughout the world a persistent demand for

Table II—Motor Vehicle Production, Imports and Exports of Producing Countries

Countries	Production 1931 Pass. Cars	1931 Trucks and Busses	1931 Total	Production 1932 Pass. Cars	1932 Trucks and Busses	1932 Total	Imports 1931	Imports 1932	Exports 1931	Exports 1932	Per Cent of Production Exported 1931	Per Cent of Production Exported 1932
United States	1,973,090	416,648	2,389,738	1,135,491	235,187	1,370,678	736	540	128,357	65,492	5.4	4.8
Canada	65,093	17,528	82,621	50,718	10,098	60,816	9,009	1,318	13,813	12,374	16.7	20.3
Total	2,038,183	434,176	2,472,359	1,186,209	245,285	1,431,494	9,745	1,858	142,170	77,866	5.8	5.4
Austria	2,530	1,570	4,100	1,375	989	2,364	1,506	1,286	932	466	22.7	19.7
Belgium	2,900	300	3,200	1,700	525	2,225	5,869	4,005	405	203	12.7	9.1
Czechoslovakia	12,850	4,130	16,980	10,635	2,945	13,580	1,780	890	1,179	357	6.9	2.6
Denmark	.....	193	193	.....	148	148	4,046	834	.....	.....	....	....
France	161,315	35,545	196,860	137,710	33,245	170,955	2,768	1,789	26,318	19,206	13.4	11.2
Germany	62,529	14,696	77,225	44,967	7,718	52,685	3,772	2,203	11,220	11,025	14.5	20.9
Hungary	.....	237	237	.....	121	121	274	155	.....	.....	....	....
Italy	22,950	6,330	29,280	25,600	3,500	29,100	580	595	11,942	6,490	40.8	22.3
Japan	.....	531	531	.....	675	675	3,089	1,700	.....	.....	....	....
Poland	.....	200	200	75	100	175	(a)	(a)	.....	.....	....	....
Soviet Russia	20,500	(1)	20,500	4,185	22,664	26,849	(a)	(a)	.....	.....	....	....
Spain	80	170	250	75	360	435	7,108	8,307	29	7	10.2	1.6
Sweden	693	1,751	2,444	890	2,125	3,015	10,633	3,331	275	590	11.2	19.5
Switzerland	75	995	1,070	27	969	996	10,427	9,601	161	52	15.0	5.2
United Kingdom	160,178	63,041	223,219	186,116	58,318	244,434	3,608	3,072	24,312	40,178	10.9	16.4
Total except U. S. and Canada	446,600	129,689	576,289	413,355	134,402	547,757	55,460	37,768	76,773	79,574	13.3	14.5
Grand Total	2,484,783	563,865	3,048,648	1,599,564	379,687	1,979,251	65,205	39,626	218,943	156,440	7.1	7.9

(1) Included with passenger cars. (a) Not available.

Share of World Motor Markets

By C. F. Baldwin,
Assistant Chief, Automotive Division, Bureau of Foreign & Domestic Commerce, U. S. Department of Commerce

Table I—World Production of Automobiles

	1929	1930	1931	1932
World total	6,277,451	4,126,470	3,048,648	1,979,251
Increase (+) or decrease (—) per cent	+20.6	—34.3	—26.1	—35.1
	Per Cent of Total			
United States	83.7	81.3	78.4	69.3
Canada	4.6	3.7	2.7	3.1
European countries	11.7	15.0	18.9	27.6
Total	100.0	100.0	100.0	100.0

higher-priced vehicles and, although reduced purchasing power has cut into that trade, it should quickly revive in response to improved economic conditions.

In commercial vehicle production, a trend toward lower-priced units was also evident as an answer to popular demand. Especially significant in Europe was the greater relative production of Diesel engine-trucks and busses, both for local consumption and export, while greater interest in this type of vehicle was evidenced in the American industry.

The United Kingdom, Soviet Russia, Sweden, Spain and Japan were the only countries to increase their automobile output in 1932. The United Kingdom with an increase of 8 per cent or 21,215 units registered the largest numerical gain. Among the other leading producing countries the following decreases in production occurred as compared with 1931: United States 43 per cent; Canada 26 per cent; France 14 per cent; Germany 32 per cent; Italy .6 of one per cent; Czechoslovakia 20 per cent.

As in both 1931 and 1930, the rate of decrease of commercial vehicle production was slightly less than that of passenger cars in 1932. World truck and bus production in 1932 totalled 379,687, a drop of 33 per cent from the 1931 figure of 563,865 which was, in turn, 25 per cent under 1930. Passenger car output of 1,599,564 units represented a decrease of 36 per cent below the 1931 figure of 2,484,783 which was about 26 per cent under the 1930 output. The United Kingdom, Italy and Sweden produced more passenger cars in 1932 than in 1931; Belgium, Spain, Sweden and Japan increased their output of trucks and busses, while in Soviet Russia the manufacture of both was probably greater.

Exports of automobiles from producing countries totalled 156,440 units in 1932, a decrease of 28 per cent from the 1931 figure of 218,943. The percentage of world production exported was 7.9 in 1932 as compared with 7.1 in the previous year. The ratio of exports to production of the United States and Canada combined was 5.4 per cent in 1932 as against 5.8 per cent in 1931—of all other countries 14.5 per cent in 1932 and 13.3 in 1931. In connection with the American export trade, however, consideration must be given to our large exports of parts for assembly; in 1932 over 26 per cent of our total exports of automotive products left the country in this form. Only two countries, the United Kingdom and Sweden, recorded export volume increases during the year, and four, the United Kingdom, Canada, Germany and Sweden, registered gains in the proportion of exports to production. The rank of leading exporting countries was changed by the rise of the United Kingdom to second place, supplanting France which in 1931 was second to the United States; and by the rise of Germany to fifth place at the expense of Italy which dropped to sixth.

An analysis of the leading foreign markets for automobile manufacturing countries in 1932 gives an indication of the changes caused by competitive developments and by various consequences of the depression which brought about alterations in the channels of trade. Belgium continued to be the best customer of the United States (because of the extent of American assembly operations in Belgium a considerable portion of exports to that country are ultimately re-exported) but Sweden yielded second place to Japan and dropped to eighth in 1932; Argentina rose from sixth to fifth and British India dropped from fifth place to seventh. In 1931 the Irish Free State was the United Kingdom's best market but in 1932 it dropped to third place while Australia took the lead; New Zealand, third in 1931 was sixth in 1932. France's best markets showed little change in relative importance except that Spain ranked fourth in 1932 instead of seventh in 1931. Canada's best market continued to be the Union of South Africa but India dropped from second place in 1931 to fifth in 1932 and British East Africa from third to sixth. Among German markets Belgium and Switzerland, first and second recpectively in 1931, retained their places in 1932.

American Standards Yearbook

THE American Standards Yearbook, just published by the American Standards Association of New York, gives an outline of how American standards are developed and contains an Index to Approved American Standards, an Index to Uncompleted ASA Projects, a list with brief description of American Standards and Uncompleted Projects, arranged according to industries, a list of cooperating bodies, a membership list, etc. The Association also has a booklet entitled "Does Industry Need a National Standardization Organization?"

Automotive Industry Flays Tax Program as Opposition to Recovery Bill Grows

Enactment Without Major Modification Seems Certain Because of Desire to Have Congress Adjourn Soon — Labor Provisions Questioned

WASHINGTON, D. C. — Discriminatory federal taxes on motor vehicles, tires, parts and accessories and taxes on gasoline, including the new ¾ cent levy, again were the object of sharp attack by the automotive and related industries last week. Pyke Johnson, vice-president of the National Automobile Chamber of Commerce, appearing by direction of President Alvan Macauley of the Chamber, told the Senate Committee on Finance last week that customers of the automotive trade are already subjected not simply to double but to treble and quadruple taxation. They are now paying, he said, $200,000,000 in special federal taxes in addition to special taxes in more than two-score forms to the state and local governments besides general taxes paid in common by all taxpayers.

Despite the overwhelming case built up by the automotive industry repeatedly against the vicious system of taxation to which it is subjected, it is thought doubtful that the Senate Committee will lift the burden. It was urged by the automotive trade through Mr. Johnson, as it was urged by other groups, to enact a general sales tax. But the farm group and the labor group are opposed to a general sales tax. That seems to be sufficient to frighten politicians.

The National Association of Manufacturers, representing 56,000 manufacturers, has turned sharply on the measure because it provides no control over foreign competition in the face of the fact that the bill will inevitably mean higher costs and greater wages for industry. Industry also is much more concerned than even some of its representatives have openly indicated over the tremendous power given organized labor in the bill.

Features for collective bargaining and the swipe taken at company unions have led more than one industrialist to say these provisions mean a widespread move on the part of organized labor to unionize industry. They say that the provisions, one-sided in that they give advantages to labor without similar advantages to industry, can be used as forces that will prevent industry from setting up codes unless labor is given what it wants.

Certain it is that without codes, industry would not be able to operate if the bill becomes a law as expected, although the trend from it indicates to many that, if it could be held up much longer, it would be defeated despite the administration support. There are known to be a number of Democratic senators who are opposed to the bill on general principles and others who are opposed to some of its features, especially that portion suspending the anti-trust laws. This is the one chief feature favored by industry.

Supporters of the measure think it will go through the Senate within a week with but little change from the form in which it passed the House. The nearness of adjournment, it is contended, means that the Senate does not propose to make sweeping changes, no matter what the views of Senators individually may be. To do so would mean possible tying the bill up in conference and thus delay adjournment, as well as postponing the attainment of the purposes for which the administration says the bill is intended—that of restoring employment.

For November Delivery

DETROIT — Graham-Paige Motors Corp. has reported the receipt of paid-in-advance retail orders for delivery of cars in August and November from dealers in Florida and California. Both buyers declared that car prices were bound to go up soon and that they wanted to be sure of getting the benefit of present low prices. The orders were accepted and filed for future delivery.

Walter C. Allen

NEW YORK — Walter C. Allen, who after a long illness, died last week at the age of 57, was connected in several capacities with the automotive industry up to a few years ago. He was at first, in the early nineteen hundreds, an importer of foreign cars, later president of the Allen-Kingston Motor Car Co., of Bristol, Conn., and more recently connected with the Bijur Lubricating Co.

Alborn Appointed

CLEVELAND—Frank G. Alborn has been appointed chief engineer of the White Motor Co. He was formerly asst. chief engineer.

NE

N.S.P.A. Lays Plans for Recovery Action

Committee OK's Principle of Bill and Maps Program of Code Adoption by Groups

DETROIT—The N.S.P.A. has appointed an Industrial Recovery Committee to make an intensive study of the National Industrial Recovery Bill and its application to the parts business. At its first meeting, it adopted a resolution, which was forwarded to President Roosevelt, endorsing the principle of the bill and offering the committee's cooperation in its administration.

The resolution indicates that it is the committee's intention to encourage groups of manufacturers producing similar or closely related items, to develop their own codes of fair competition. The adoption of codes by regional groups of wholesalers will also be fostered. The committee itself also plans to adopt a basic code which will serve as a guide for the groups. As soon as the bill is enacted, meeting of these groups and sub-divisions will be called.

The N.S.P.A. also is initiating action which it is hoped will result in cooperative action among the various associations in the parts industry.

Broulhiet to Speak at S.A.E. Congress

NEW YORK—Georges Broulhiet, noted French engineer, will speak at the S.A.E. International Automotive Engineering Congress, Chicago, Aug. 28 to Sept. 4, according to an announcement by John A. C. Warner, general manager of the Society. M. Broulhiet, who is a consulting engineer in Paris, France, and a member of the Council of the French Societe des Ingenieurs de l'Automobile, will discuss the subject of independent wheel suspension, on which topic he is widely known as one of the foremost authorities in the world.

NEWS

200,000 Scheduled for June Following May Output of Close to 220,000 Units

Retail Sales Continue to Climb in Last Ten Days of May, Pointing to Sales Total for That Month of 170,000 Passenger Cars and Trucks

By Athel F. Denham
Field Editor, Automotive Industries

DETROIT—Increases in production schedules during the last ten days of May make a production total for that month of 210,000, as estimated last week practically a certainty with a possibility that final figures will show a total in excess of 220,000, an increase of better than 11 per cent over May, 1932. This is in spite of a slight decline in production schedules reported for Ford.

A third step-up in production at Plymouth brought that company's May output to better than 34,500 cars, the best month in its history. Plymouth production in June, it is estimated, will be between 32,000 and 34,000. During the week ending May 27, sales of this make set a new record.

By the time this report is published furthermore Oldsmobile and Pontiac will so far this year have exceeded production totals for the entire year of 1932.

Tentative June schedules again call for production totals exceeding the 200,000 mark as compared with 190,600 in June of last year. Actual production, of course, will depend largely on sales developments during the month, but the chances are in favor of the estimate being exceeded.

Retail deliveries continued their climb during the closing ten days of May with almost definite assurance that the estimated 170,000 domestic sales figure will be reached or exceeded for the month.

The Ford production figure is extremely difficult to analyze as yet, particularly because of the fact that banks of parts built up during the strike period earlier this year have gradually been fed back into the line. Actual completed cars and trucks have been running well in excess of motor production for instance. As a result of this situation many Ford parts suppliers have been receiving increased releases in a number of cases, while Ford production actually has been reduced. As nearly as it is possible to ascertain, Ford May production totaled somewhere between fifty and fifty-five thousand units.

Miller Quits Racing for Air Competition

Will Build Special Job, However, for Attempt at World's Land Speed Mark

LOS ANGELES—Because of his belief that present rules and regulations at the Indianapolis race favors the semi-stock car and that the reduction in prize money makes it impractical to build special cars and engines, Harry A. Miller has retired

Harry A. Miller

from the manufacturing of special cars and engines. Cars carrying Miller engines finished one-two-four in Tuesday's 500-mile race, giving Mr. Miller eight wins in 12 years.

He does, however, anticipate building two special high-speed cars, one to compete for all existing records up to 200 miles per hour and the other for the beach record and capable of doing better than 300 miles per hour. These cars are to be made for record use only and will not be used on any speedways in the country, and will be powered with engines similar to the type he anticipates using for aviation racing purposes.

Mr. Miller also is compiling a book which will contain information such as various records, general construction of his engines and cars, types of steel, heat treatment tests, timing charts, fuels and oils. This book will also contain pictures and the biography of some of the renowned racing drivers. These books will be released shortly.

These Miller cars have won eight out of eleven races held at Indianapolis and have held the record for the fastest qualifying time, including this year. As a matter of fact, Miller cars hold all the records except the straight-away at Daytona Beach, Fla.

Col. Glover on Leave

DETROIT — Col. Fred Glover, president of the Timken Detroit Axle Co., at his request has been given a leave of absence because of ill health. William F. Rockwell, president of Wisconsin Axle Co., has assumed his duties. Walter F. Rockwell, Wisconsin general manager, has been elected a vice-president and a member of the board of the Timken company.

Pontiac Has Big May

DETROIT — Pontiac production schedules for May were more than 69 per cent over the original estimate and 104.3 per cent above Pontiac production for May last year, according to an announcement made today by R. K. White, sales manager.

Frame Production Gains

MILWAUKEE — Production of automobile frames by the A. O. Smith Corp. has grown to from 80,000 to 100,000 units a month, following the pick-up in the passenger car business, it is reported.

Gas Consumption Lower

NEW YORK—Average daily consumption of gasoline in March, 1933, was 5.8 per cent smaller than last year, but six per cent ahead of February.

MacMillan Named

SAN FRANCISCO—National Motor Bearing Co. has appointed Harry L. MacMillan as general sales manager for all its products. Mr. MacMillan was formerly district manager for King Quality Products Co.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

Current trade reports continue to show advances in production and distribution, as well as higher prices. Stock and commodity markets received a new stimulus last week from the announcement that the Federal Reserve banks would begin adding to their holdings of Government securities, together with the reduction in the rediscount rate of the Federal Reserve Bank of New York from 3 to 2½ per cent and the introduction of the legislation invalidating the "gold clause" in bonds and other contracts.

Freight Loadings Gain

Evidence of continued expansion in business volume is found in the weekly report of railway freight loadings for the week ended May 20. Loadings during that period totaled 531,618 cars, showing an increase of 523 cars above the total for the preceding week and an increase of 15,990 cars above the corresponding period last year.

Industrial Production Up

The Federal Reserve Board, in its monthly summary of business conditions, reports that business improvement, which started in April, continued during the first three weeks of May, with wholesale prices of many leading commodities also advancing. The board finds that the improvement was particularly noticed in the latter part of April and the early part of May. The volume of industrial production, as measured by the board's seasonally adjusted index, increased from 61 per cent of the 1923-25 average in March to 67 in April, as against 63 a years ago and a low of 58 last July.

Chain Store Sales Increase

Rallying with the powerful stimulus of Easter buying, chain store trade in April scored a recovery which carried considerably beyond seasonal proportions, according to a survey issued by *"Chain Store Age."* Impressive gains were made by the five-and-ten, apparel and shoe chains, which benefited most from the holiday activity.

Power Production Higher

Production of electricity by the electric light and power industry of the United States for the week ended May 20 was the highest the week of January 21. The percentage increase over the figure for the corresponding period last year was 3.3 per cent, as against a gain in the preceding week of 2.2 per cent over the comparable 1932 figure.

Lumber Active

Lumber orders at the mills exceeded previous 1932 and 1933 records during the week ended May 20, and production and shipments made similar records. Unfilled orders at the mills on that date were equivalent to 20 days' average production, the highest since 1930.

Crude Oil Production

Average daily crude oil production for the week ended May 20 amounted to $2,705,350 barrels, as against 2,733,850 barrels during the preceding week and 2,225,350 barrels a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended May 27 stands at 61.2, as against 60.6 a week earlier, 59.5 two weeks earlier, 59.2 three weeks earlier, and 58.6 four weeks earlier. The current figure is the highest for the year to date.

Federal Reserve Banks

Holdings of Government securities by the Federal Reserve banks increased $25,000,000 during the week ended May 24. The increase, however, was more than offset by decreases in other forms of Reserve credit, including a decline of $33,000,000 in bills bought in the open market and a decrease of $18,000,000 in bills discounted, with the result that total holdings of bills and securities declined $28,000,000. Federal Reserve notes in circulation declined $79,000,000, while Federal Reserve bank notes increased $10,000,000. Deposits increased $73,000,000 and reserves $37,000,000, and the reserve ratio rose from 67.1 to 67.8 per cent.

Chrysler-De Soto Cut Prices $30 to $110

Reductions Apply to All Models Except Chrysler Custom Imperial Series

DETROIT—Reductions in list prices ranging from $30 up on Chrysler and De Soto lines have been announced by the Chrysler Corp. While no official statement has been made, it is learned on good authority that these price reductions do not indicate a forthcoming introduction of new models. The new list prices follow:

	New Price	Reduction
De Soto—Standard Models		
Business coupe.....	$665	$30
Brougham	665	30
Rumble seat coupe.	705	30
Sedan	735	30
De Soto—Custom Models		
Rumble seat coupe.	750	40
Sedan	795	70
Convertible coupe..	775	70
Convertible sedan..	875	100
Chrysler Six		
Business coupe.....	745	50
Brougham	745	50
Rumble seat coupe.	775	60
Sedan	785	60
Convertible coupe..	795	90
Convertible sedan..	945	110
Chrysler Royal Eight		
Business coupe....	895	50
Rumble seat coupe.	915	70
Sedan	925	70
Convertible coupe..	945	90
Convertible sedan..	1,085	110
7-pass. sedan.....	1,125	70
Chrysler Imperial Eight		
Rumble seat coupe.	1,275	80
Sedan	1,295	100
5-pass. coupe.....	1,295	100
Convertible coupe..	1,325	100
Convertible sedan..	1,495	100

Prices on the Chrysler Custom Imperial continue unchanged.

Allis Gets U. S. Order

MILWAUKEE — Allis-Chalmers Mfg. Co. has booked an order for 50 large crawler-type tractors from the United States Army for the motorization of artillery. Inquiry has also been made by the Government for prices on 150 crawlers for the national reforestation program. In the agricultural tractor field, according to H. C. Merritt, general manager of the tractor division here, an upturn is noticeable due to the "very much better feeling among the nation's farmers," who have experienced substantial increases in the prices received for their products.

Pierce Signs Two

BUFFALO, N. Y., May 26.—The signing of two major Pierce-Arrow distributorships, the Faunce Motor Co. of Pittsburgh, and Rice Motors, Inc., of Cincinnati, has been announced by Roy H. Faulkner, Pierce-Arrow's vice-president in charge of sales.

Willys Operations Approaching Crisis

Bondholders' Committee Points to $6,000,000 Working Capital Deficit and Operating Losses

TOLEDO—"Combination of a working capital deficit of $6,339,083, continuing operating losses and mounting totals of unpaid taxes, makes it evident that unless substantial amounts of new working capital are obtained promptly, operations cannot be continued indefinitely," the Willys-Overland bondholders' protective committee say in a letter dated May 24, 1933.

Receivers report that operations since their appointment have been carried on at a loss. Moreover during the period Jan. 1 to Feb. 15, the company sustained a net loss of $654,153. Few passenger cars are now being produced, operations being devoted mainly to the manufacture of I. H. C. trucks.

Net loss for the year ended Dec. 31, 1932, amounted to $6,627,917 after depreciation, interest, etc., as compared with a net loss of $14,021,244 in 1931. Net sales in 1932 amounted to $13,976,549 against $38,384,323 in 1931, a decline of 63.6 per cent.

As of Feb. 15, 1933, the balance sheet for the parent company only shows current assets of $2,172,115, consisting of $57,482 cash, $18,517 drafts, etc., $66,072 receivables and $2,030,044 inventories. Before giving effect to the $2,000,000 bonds, current liabilities on this date totaled $6,531,198 and the working capital deficit $4,369,083.

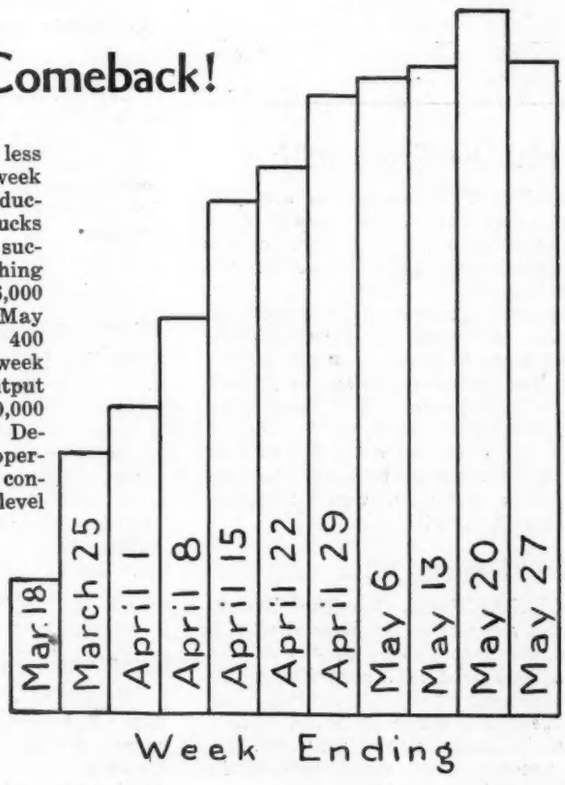
The Dec. 31, 1932, consolidated balance sheet shows current assets of $3,524,769 including $137,322 cash, $598,977 receivables and $2,788,470 inventories. Current liabilities amounted to $5,941,752, before giving effect to the $2,000,000 bonds due Sept. 1, 1933. The excess of current liabilities over current assets totaled $2,416,983, exclusive of the bonds.

The company owes $501,208 in back taxes which represent a prior claim on fixed assets. Property at book value is $20,997,234 and in addition there is pledged under mortgage, certain stocks of subsidiary companies valued at $4,263,000. The bondholders committee has requested the trustee to demand an assignment of debts owed by subsidiaries to Willys-Overland for benefit of bondholders. Such debts total $7,332,917.

Receivers have indicated that it would require $75,000 to put machinery in shape to prevent deterioration and a continuing maintenance and insurance charge of about $87,000 a month if the plant is shut down. It is believed here that the appeal of the bondholders is preliminary to development of reorganization. G. Munor Hubbard is chairman of bondholders committee; Clifford B. Reeves, secretary, and other members are George N. Lindsay and Don M. Kelley, all of New York.

What a Comeback!

From low of less than 11,000 in the week of March 18, production of cars and trucks increased for nine successive weeks reaching a total of about 56,000 in the week ending May 20, a gain of over 400 per cent. In the week ending May 27, output was in excess of 50,000 and reports from Detroit indicate that operations are being continued at a high level into June.



Metal Prices Hold Upward Trend

Steel Sellers Reluctant to Commit Themselves for More Than Next Two Months

NEW YORK—Conjectures in the steel market as to what definite effect on costs and prices coordination under the Industry Control bill will have are closely interwoven with speculation as to the attitude that the country's leading steel producing interest will take toward the labor policy provided under the new set-up.

The United States Steel Corporation, producing approximately 40 per cent of the country's steel, in the past has made great sacrifices to remain master in its own house when it came to employment conditions, this principle being one of the legacies from Judge Gary's administration. Its wage scales, however, have permitted its employees to fare fully as well as have those in union plants. Promulgation of a scale of minimum wages, under the powers conferred upon the President by the new legislation, would in no wise alter this status and come in for the steel industry's wholehearted support, but the situation would, in the steel market's opinion, be altered if union recognition should in any way be introduced into the regulations.

The steel industry, as a whole, has now attained a volume at which it can operate satisfactorily at the prices that have been chalked up for the third quarter. Steel bars are now prominently mentioned as next in line for upward revision. Many sellers are reluctant to commit themselves beyond the ensuing two months at any price level. Seasonal influences, while belated, are certain to develop more and more from now on and are likely to make for mild recessions in the demand for some lines next month, but the market has broadened and some consuming industries that had been apathetic for a long time are beginning to order, and these will to some extent make up for seasonal declines in other directions. Discounts on bolt prices were lowered on Monday.

Pig Iron—It is estimated that pig iron sales in the first five months of 1933 have exceeded the entire sales volume of 1932. Backlogs suffice to carry stacks now in blast through the third quarter. More and more stacks will go into production, however, from now on. Prices rule uniformly strong.

Copper—Producers advanced the domestic price to 7½c. on Monday, this being followed by corresponding advance in prices of all copper and brass products. Fabricators have increased their operating rates to between 40 and 50 per cent of capacity. Copper production is thought to be somewhere between 15 and 20 per cent. With London prices now around 40 Pounds Sterling, the best in sevcral years, export possibilities continue to assure a gradual reduction of the American surplus stocks, this in addition to the improved domestic consumption. On Wednesday 7¾ cents was asked for electrolytic and some producers held their metal at 8 cents.

Cars Retailing Under $1000 Get 94 Per Cent of Volume in First Four Months

Continued Trend to Low-Priced Field Indicates Shrinkage in Dollar Volume Despite 9.1% Gain in Units Produced

PHILADELPHIA — Low-priced cars continue to dominate the 1933 production of the automotive industry. During the first four months of 1933, output of cars wholesaling for $500 or less increased 80 per cent over the same period in 1932 and accounted for 79.1 per cent of total production as against 48 per cent a year ago.

These gains were largely at the expense of cars wholesaling between $501 and $1,000. Production of cars wholesaling from $501 to $750 dropped 49 per cent from last year, while those selling at the factory at from $751 to $1,000 dropped 75.6 per cent.

Cars retailing under $1,000 (roughly those wholesaling under $750) represented 94 per cent of unit volume during the first four months as against 80.1 per cent in 1932. Those wholesaling at over $1,000 accounted for only 3.5 per cent of volume during the first four months as against 8.3 per cent last year.

These shifts in price-class distribution point to a substantial reduction in the industry's dollar volume this year despite the fact that the number of units produced 9.1 per cent larger in the first four months of this year than in the same period in 1932.

Truck production shows similar tendencies with trucks rated at 3½ tons and over accounting for only 1.2 per cent of total truck output as compared with 2.6 per cent last year.

Passenger Car Production by Wholesale Price Classes
(Figures for the First Four Months)

	1933	1932	Per Cent Change	Per Cent of Total 1933	Per Cent of Total 1932
Under $500	374,291	207,709	+80.0	79.1	48.0
$501-$750	70,606	138,901	—49.0	14.9	32.1
$751-$1,000	12,278	50,311	—75.6	2.6	11.6
$1,001-$1,500	8,599	24,018	—64.2	1.8	5.5
$1,501-$2,000	3,579	5,127	—30.5	0.8	1.2
$2,001 and over	3,561	7,053	—49.5	0.8	1.6
Total	472,914	433,119	+ 9.1	100.0	100.0

Truck Production by Capacities
(Figures for the First Four Months)

	1933	1932	Per Cent Change	Per Cent of Total 1933	Per Cent of Total 1932
1½ tons and less	79,852	88,344	— 9.6	93.8	92.7
2-3 tons	4,239	4,527	— 6.4	5.0	4.7
3½ tons and over	718	2,047	—65.0	0.8	2.2
Ambulance, fire, buses	315	346	— 9.0	0.4	0.4
Total	85,124	95,264	—10.7	100.0	100.0

Steve Hannagan in New Job

INDIANAPOLIS — Steve Hannagan, famed press agent for the Annual 500 Mile Race and other motor competitions, wound up his career as press representative for the Speedway with the running of the twenty-first annual race on Tuesday of this week. Steve announces that he is going with Lord & Thomas.

Hupp Gains 42%

DETROIT—Rufus S. Cole, vice-president in charge of sales, Hupp Motor Car Corp., has reported that shipments for the month of May up to the twentieth, show an increase of 42 per cent over shipments for the same period last month. Deliveries to buyers for the four weeks ended May 20, compared with the previous four-week period, showed an increase of 25 per cent, while the number of unsold cars in dealers' hands is 53 per cent less than at the same time last year.

Studebaker Ships 4000

SOUTH BEND—May shipments of Studebaker cars approximated 4000 against 3600 in April. Unfilled orders at the beginning of June totaled about 1500 cars.

On June 1, cash on hand is reported to have amounted to about $1,750,000 against $1,300,000 a month earlier. Operating expenses also have been reduced materially and in April were $600,000 under April, 1932. About June 10, the receivers are expected to publish a balance sheet as of the date of their appointment and an income account for April.

Moves Buffalo Office

YOUNGSTOWN, O.—The Buffalo district sales office of Republic Steel Corp. has been moved to 475 Abbott Road, Buffalo, N. Y., according to an announcement by N. J. Clarke, vice-president in charge of sales. Thos. B. Davies, district sales manager, and his present staff will continue in charge at the new location.

Dodge Sales Show 26th Weekly Gain

DETROIT—During the week ending May 20, Dodge dealers delivered 3894 units—an increase of 12.8 per cent over the record of the preceding week in which deliveries were 3452 units.

Of the week's 3894 retail deliveries, 1859 were of Dodge passenger cars, an increase of 11.2 per cent, while 1679 units represented Dodge dealers' share of the enlarged production of Plymouth standard and de luxe sixes, an increase of 12.9 per cent. And 356 of the units figuring in the tabulation were Dodge trucks, a gain of 21.5 per cent or 63 units over deliveries recorded for the previous week.

Deliveries made by Dodge dealers for the week ending May 20, compared to deliveries made during the corresponding week of 1932, marked an increase of 64.7 per cent.

Herbert I. Lord

DETROIT—Herbert I. Lord, aged 57 years, vice-president and treasurer of Detroit Lubricator Co., died May 25, after an illness of several weeks. He joined Detroit Lubricator in 1906 following a connection with American Radiator Co., in Chicago. Mr. Lord was chairman of Lee and Cady and a director for several other concerns, including the Detroit City Gas Co. In 1926 he was vice-president of the Railway Business Association.

Reynolds Reports Profit

CHICAGO—Reynolds Spring Co. expects to show net profit of between $25,000 and $30,000 for May, which will be equal to about $1.50 a share on the common stock on an annual basis, Charles G. Munn, president, has disclosed.

Graham Appoints Chambers

DETROIT — Graham-Paige Motors Corp. has appointed W. Harry Chambers as district manager over a newly formed Atlanta district comprising the territories under the distributors at Atlanta, Augusta, Chattanooga and Columbus, Ga.; Birmingham and Mobile, Ala.; and Pensacola, Fla. J. C. Cambrey has also been named field salesman for

Diamond T Exports Gain

CHICAGO—The Diamond T Motor Car Co. reports that its export shipments for the first four months of this year are 92 per cent greater than for the same period last year.

New Planes Speed Up Air-Express Service

Dimension Maximum Increased. April Shipments Show Large Gain Over Last Year

PHILADELPHIA—A decided advance in the development of rail-air-express service has been effected through the addition of several new Boeing multi-engined planes to the fleet of the United Air Lines, according to an announcement by F. R. Lindsay, general manager of the Railway Express Agency, Inc.

The increased cargo space of these new planes has resulted in an increase in the dimension maximum of R.E.A. air-express shipments, upon which regular tariff rates are applicable, from 200 to 400 cu. in. The 170-m.p.h. speed of the new planes will materially reduce the time of transit. The new schedules will show, for example, reductions in rail-air-express time from Philadelphia to Cleveland of 1 hr.; Toledo, 1½ hr.; Chicago, 2 hr.; San Francisco, Los Angeles and Seattle, 5 to 7 hr.

Under the new schedule covering rail-air-express shipments out of Philadelphia, such cities as St. Paul and Minneapolis, Fargo and Bismarck, N. D., Omaha, St. Joseph, Kansas City, Dallas, Fort Worth, Tulsa and Oklahoma City will, in effect, be brought into the over-night delivery zone.

According to General Manager Lindsay, the 4392 shipment units for the month of April over the R.E.A. air-express system throughout the nation, represents an increase of 231.5 per cent over the total for the corresponding month of last year.

Waukesha Motor Gets Hesselman License

WAUKESHA, WIS. — Waukesha Motor Co. has announced completion of license arrangements with the Hesselman Co., Stockholm, Sweden, for the American rights to the oil engine patents of the foreign concern. Waukesha Motor will manufacture a line of heavy oil engines for truck, tractor and general industrial service. Ingersoll-Rand Co. has held a similar license for portable air compressors and for more than a year Waukesha Motor has been manufacturing the units, several hundred of which have been exported to Europe and the Orient.

Hesselman engines, it is explained, occupy a place midway between the automotive Diesel engine and the gasoline engine. They burn the same fuels as Diesels and some a Diesel cannot utilize, but use electric ignition.

Automotive Oddities—By Pete Keenan

Write us if you know an Oddity

SECRETARY OF THE TREASURY WOODIN EX-PRESIDENT OF AMERICAN CAR & FOUNDRY CO. WROTE THE INAUGURAL MARCH MUSIC FOR THE LAST INAUGURATION.
TWO BOEING PLANES RECENTLY PASSED EACH OTHER GOING IN OPPOSITE DIRECTIONS YET EACH HAD A 40 MILES TAIL WIND.
FOUNTAIN AND FLOOD STUDEBAKER SALES WYANDOTTE. MICH.
SUPERCHARGED PACKARD ENGINES IN THE SPEED BOAT "MISS AMERICA" GENERATES MORE POWER THAN THE 20th CENTURY LOCOMOTIVE.
THIS DRIVERLESS CAR RAN WILD DOWN A STREET, BUMPED DOWN A STAIRWAY AND CAME TO A STOP ON A FRAIL BRIDGE. WITHOUT DAMAGE. OR INJURING A 70 YEAR OLD WOMAN PASSENGER. San Diego. Cal.

G. M. First Quarter Profit $6,807,007

Reduction in Annual Charges of $7,750,000 Indicates As Result of Plant Write-Down

NEW YORK—A reduction of approximately $7,750,000 in the annual charge made by General Motors for depreciation, is indicated by the first quarter statement released this week. The depreciation charge for the quarter ended March 31, 1933, amounted to $7,369,586 as compared with $9,306,963 in the 1932 quarter, the difference of $1,937,377 representing approximately one-quarter of the annual saving resulting from the write-down of the plant and property account made at the end of 1932.

As the preliminary report published in *Automotive Industries* of April 29, net earnings in the first quarter were $6,870,007 after depreciation, taxes, etc., against $9,306,963 in the corresponding 1932 quarter.

Comparative figures from the balance sheet follow:

	March 31, 1933	Dec. 31, 1932
Current Assets	$257,946,908	$283,258,874
Cash	90,162,440	151,152,747
U. S. Securities	23,824,334	19,327,083
Other Marketable Securities	21,724,912	2,300,865
National Bank of Detroit Stock	12,500,000	.....
Inventories	76,184,220	75,478,612
Current Liabilities	40,478,208	57,821,680
Capital Stock and Surplus	857,093,357	863,261,190
Cash in Closed Banks, 4/25/33	13,943,878	.....

Partial List of Papers Scheduled for the S.A.E. International Automotive Engineering Congress

Palmer House, Chicago, August 28 to September 4, 1933
During the Century of Progress Exposition

Motor Trucks and Motorcoaches

Development in Ordnance Automotive Equipment — Maj. H. A. Nisley, Ordnance Dept.

Military Theories & Development of Motor Transportation —Lieut. Col. Brainerd Taylor, Quartermaster Corps, U. S. Army.

Factors Controlling Brake Design—B. B. Bachman, The Autocar Co.

Legislative Requirements with Respect to Brake Effectiveness and an Analysis of Various Codes—David Beecroft, Bendix Aviation Corp.

Transportation and Maintenance

Restrictive Legislation and Regulation of Motor Transportation—F. C. Horner, General Motors Corp.

Summary of 1933 Legislative Activities—Pierre Schon, General Motors Corp.

Economies in Motor Vehicle Operation—Clinton Brettell, R. H. Macy & Co.

Economies in Motor Vehicle Operation—L. V. Newton, Bylesby Engrg. & Management Corp.

Predetermined Operating Requirements for Purchasing Equipment—J. M. Orr, Equitable Auto Co.

Fuels and Lubricants

Hydraulic Action in Piston Ring Design—D. D. Robertson, Wilkening Mfg. Co.

Relationship of Finish and Accuracy to Piston Ring Performance—R. R. Teetor, Perfect Circle Co.

Oil Consumption—J. P. Stewart, Vacuum Oil Co.

Engine Friction Analysis—L. C. Lichty and G. B. Parsons, Yale University.

Extreme Pressure Lubricants —O. C. Bridgeman, Bureau of Standards.

Stability of Motor Oils in Service—D. P. Barnard, Standard Oil Co.

Joint Session of Transportation & Maintenance and Fuels & Lubricants

Why Waste Fuel through the Exhaust?—L. T. White, Cities Service Oil Co.

Fuel Economy from the Engine Designer's Point of View—J. B. Macauley, Chrysler Corp.

Production

Equipment Policies and Utilization of Machine Tools — Joseph Geschelin, *Automotive Industries.*

Current Practice in Finishing Gear Teeth—F. W. Cederleaf, Buick Motor Co.

Passenger Cars and Passenger-Car Bodies

The Engineer's Place in the Economic Picture—C. F. Kettering, General Motors Research Labs.

Address by President E. C. Elliott of Purdue University.

What Is the Matter with American Cars?—L. H. Pomeroy, Daimler Co., Ltd., Coventry, England.

Future of Individual Transportation—W. B. Stout, Stout Engineering Laboratories.

Independent Springing—Georges Broulhiet, Consulting Engineer, Paris, France.

Engine Mountings — Alex Taub, Chevrolet Motor Co.

Budgeting Body Construction and Tool Costs—N. H. Manning, Briggs Manufacturing Co.

Air Conditioning and Relative Refinements for Automobile Body Design—F. A. Moss, George Washington University.

Aircraft and Aircraft Engines

Commercial Application of Airships—J. C. Hunsaker, Goodyear Zeppelin Corp.

Magnetic Inspection of Hollow Steel Propellers—Hamilton Foley, Pittsburgh Screw & Bolt Corp.

Further Information Relative to Flight Loads—R. V. Rhode, National Advisory Comm. for Aero.

Tail Surface Vibration Phenomena—J. A. Roche, U. S. Army Air Corps, Wright Field.

Scheduled Aircraft Operations—P. G. Johnson, Boeing Airplane Co.

Maintenance of Aircraft on Scheduled Service—Jack Frye, Transcontinental & Western Air, Inc.

Russian Aviation — A. A. Adams, United Aircraft Industries of U.S.S.R., Moscow.

Altitude Performance of Aircraft Engines Equipped with Gear-Driven Superchargers — R. H. Gagg, Wright Aeronautical Corp.

Industry Studies Many Puzzling Problems Presented by Industrial Recovery Bill

Possible Effects on Labor Relations Occasion Concern — Methods of Administration and Details of Codes of Fair Competition Are Serious Problems

PHILADELPHIA — Two weeks of study and discussion have failed to clear up many of the uncertainties with which the industry was confronted by the introduction of the National Industrial Recovery Bill.

Perhaps the major question which is puzzling the industry is the effect of the Bill on its labor relations. Automotive factories have always been non-union and more than passing concern is felt over the possibility that the passage of the proposed legislation will militate against a continuance of this traditional policy.

Despite the fact that it is generally conceded in Washington that the Roosevelt interest in the Bill centers around the reduction of unemployment, in some quarters major attention is being directed at the possibilities under the Bill of realigning merchandising practices. How much enthusiasm the administration consequently will display for codes of competition which seek mainly to control the channels and methods of distribution, is open to question.

Some light is thrown on this point by a recent bulletin of the U. S. Chamber of Commerce which lists maximum hours and minimum wages as the first two points to be covered in proposed codes of fair competition. The bulletin lists price agreements third but says later that agreements to prevent selling below cost must necessarily define the term "cost" and provide a definite method for determining such cost—which raises questions which can't be settled very quickly.

Some Puzzlers

Other questions which are puzzling the industry's manufacturers include the following: How will the Bill be administered, who will administer it for the various branches of the automotive industry and what in detail should codes of fair competition comprise? Until more definite knowledge on these points is available it is not expected that important steps will be taken in adapting either the automobile or parts industry to its potential requirements.

That is the conclusion to be drawn from investigations conducted by *Automotive Industries* during the past week. It does not mean that conferences will not be held, or that details of codes for possible adoption won't be discussed. As a matter of fact, the N.A.C.C. has scheduled the Bill for discussion at its June 15 meeting while the National Standard Parts Association has already appointed a committee to draw up a tentative code. It is understood, moreover, that negotiations are under way to secure joint action on the part of the N.S.P.A., the M. and E.A. groups and the N.A.P.A. While no single one of these organizations, nor for that matter all combined, represent a majority in the parts industry it is felt in some quarters that cooperative action on their part would represent a sufficient "sampling" of the parts industry to insure cooperation on the part of non-members.

Diversity of Products

Aside from the present lack of a truly representative organization of parts makers, to administer the Act, there are other serious difficulties to be overcome. The parts industry is made up of a great number of large and small concerns manufacturing a wide variety of products and many of them are dependent for a substantial share of their business on non-automotive markets. Group action possibly would answer some of these difficulties.

It is generally estimated that there may be about 13,000,000 unemployed in this country at the present time. If it is the purpose to force any sizeable proportion of this total on the mechanical, manufacturing, and mining industries, as is indicated by this bill—the act must in the final analysis fail of complete success. According to the 1930 census, these industries employed just about 13,000,000 out of a total of 49,000,000 employed at that time. At the present time even the most optimistic cannot claim more than 30 per cent of capacity production for these industries combined, while employment within them has dropped to nowhere near 30 per cent. Particularly in the automobile industry has the plan of sharing the work among maximum numbers of men been followed in the past few years.

The 1932 figures clearly show this. Employees of automobile manufacturers as a whole averaged during 1932 almost exactly 30 hrs. per week at an average rate of pay of approximately 55 cents per hour—an income per employee of $16.50 per week, and considered rather generally by the industry as the irreducible minimum for a living wage.

And the only reason the average hours per week were so high is that during seasonal peaks the men employed worked for a few weeks at a time somewhat more than 40 hours weekly. If during these seasonal peaks employment were limited to 30 hrs. per week per man, which is not expected to be the case, the average for the year would have dropped to below 20 hrs. per week, and the average income to less than $11 per week.

One important development, however, might result from the enactment of this bill, and that would be the closer supervision of operations of parts plants supplying the car manufacturer, by that manufacturer himself. Assuming that intrastate commerce would not be subject to the Act, a parts plant could operate on a basis inconsistent with the requirements of the Bill as long as it did not sell its products outside of the state. However, when the car manufacturer ships his vehicles carrying such parts into other states the car manufacturer might easily become liable for a violation on the part of his supplier.

So much, briefly for the industrial provisions of the Bill. When it comes to the merchandising provisions, car manufacturers are completely in the dark and most likely will not attempt to take advantage of the opportunities offered until the administrative end is set up.

Advertised delivered prices, standardization of equipment items, and control of clean-up sales and bootlegging of automobiles, are among the possibilities.

A suggestion has been made to permit local dealer associations to combine to control used car allowances. Car manufacturers from past experience have excellent reason to feel certain that no such agreements would ever be effective in correcting the present trading evils. Control of used car allowances, car company executives now frankly admit, is a problem which only they can settle by cooperative action and control of the set-up. That no such action has ever been taken has of course been due to provisions of the Anti-trust laws which are set aside by the Industrial Recovery Act. Such action will be possible when the Act becomes law.

The 75 Per Cent

For the automobile manufacturers, invocation of the licensing feature would not present any insuperable difficulties. But when the conditions of the parts industry is considered the picture changes materially. Here we have hundreds of small and large concerns, manufacturing a wide variety of products and virtually all selling their products in interstate commerce. We have three major associations but all of these combined do not represent more than 25 per cent of the industry. The associations might police their own members, but what about the other 75 per cent?

Bliss Activities Center in Toledo

TOLEDO—The E. W. Bliss Co. has completed the consolidation of its manufacturing, engineering and principal sales office with those of its subsidiary, The Toledo Machine and Tool Co., at Toledo, which will result in substantial economies and increased efficiency, thereby putting the company in an improved position to take care of the needs of its many customers even more satisfactorily than in the past. The entire line of Bliss presses, can machinery and special machinery formerly built at the Brooklyn plant will be mannfactured at Toledo.

A sales office and complete repair shop will be maintained at the present Brooklyn address.

G. M.'s Tech. Will Teach Teachers This Summer

FLINT, MICH.—The General Motors Institute of Technology of this city will conduct a special training course for teachers of auto mechanics for the first time this summer.

The course will cover a period of four weeks, beginning June 19, and the number admitted will be restricted to the facilities of the Institute. Should the demand for this course prove sufficiently widespread, a second course will be started at the close of the first, Albert Sobey, director, stated.

Mr. Sobey said this course will be instituted as the result of numerous requests from teachers who have desired specific training to aid them technically in their profession.

Young Resigns as Air Commerce Head

WASHINGTON, D. C.—Clarence M. Young has resigned as Assistant Secretary of Commerce for Aeronautics and has asked President Roosevelt that he be relieved of his duties on June 15. Mr. Young originally submitted his resignation on March 4 but was requested by the President to continue in office. He became assistant secretary on Oct. 1, 1929, and prior to that was an official in that branch of the commerce department.

Chrysler Dealers Have 20% May Gain

DETROIT—May retail sales by Chrysler dealers will exceed those of any month since August, 1931, when the first Floating Power Plymouth was introduced, it is announced by J. W. Frazer, general sales manager. These sales include both Chrysler and Plymouth cars sold by Chrysler dealers.

Chrysler dealers will deliver approximately 20 per cent more cars in May, 1933, than they did a year ago in May. Their sales from Jan. 1 to date are about 10 per cent higher than they were for the corresponding period of 1932, in spite of the week's bank holiday experienced by the country in March and the more protracted financial upsets suffered by many sections of the country.

Grinding Wheels and Cutters Standardized

WASHINGTON, D. C.—Revised simplified practice recommendations covering milling cutters and grinding wheels have been mailed by the Bureau of Standards to all interested in the industry for consideration and written approval. The milling cutter recommendation, R36, effects a reduction in the number of stock sizes and varieties of milling cutters shown in the previous schedule. A large majority of all the grinding wheels used in this country fall within the nine types, the dimensions of which are set up by recommendation R45-32. There is also included in this recommendation a standard nomenclature for various classes of work found in the grinding industry.

CALENDAR OF COMING EVENTS

SHOWS

National Metal Exposition, Detroit ..... Oct. 2-6
Motor & Equipment Manufacturers Assoc., Chicago ..... Oct. 23-28
Natl. Standard Parts Assoc., Chicago ..... Oct. 30-Nov. 3
New York Automobile Show, Jan. 6-13, 1934

CONVENTIONS

National Association of Cost Accountants Convention, Waldorf- Astoria Hotel, New York ..... June 12-15
National Association Credit Men, Milwaukee ..... June 19-24
National Industrial Advertisers Assoc., Chicago ..... June 26-28
National Metal Congress, Detroit ..... Oct. 2-6

MEETINGS

Natl. Automobile Chamber of Commerce, Annual, New York City. June 15
Natl. Retail Hardware Assoc., Indianapolis ..... June 12-16
A.S.M.E. Natl. Aeronautic Meeting, Chicago ..... June 26-27
American Society for Testing Materials, Chicago ..... June 26-30
Automotive Engine Rebuilders Assoc., Annual, Chicago ..... July 10-14
S.A.E. International Automotive Engineering Congress, Chicago Aug. 28-Sept. 4
American Chemical Society, Chicago Sept. 11-15
American Transit Assoc., Chicago Sept. 18-20
Natl. Safety Council, Chicago.... Oct. 2-6
National Metal Congress, Detroit. Oct. 2-6
American Petroleum Institute, Annual, Chicago ..... Oct. 24-26

Indian Stockholders OK Reorganization Plan

SPRINGFIELD, MASS.—Stockholders of the Indian Motocycle Co. ratified plan of reorganization under which a new issue of 45,480 shares of non-cumulative 6 per cent preferred stock of $10 par would be created, of which 38,600 shares would be issued to Indu Co. in exchange for elimination of notes payable of $386,000 of Indian Motocycle held by the Indu Co. Remaining 6880 shares would be issued to holders of old 7 per cent preferred stock, $100 par, at rate of one share of new stock for each old share, together with a waiver of the $24.50 accumulated dividends accrued on the old preferred.

Common stock would be reduced to 150,000 shares from 500,000 and common stockholders would receive one new share of common for each 10 old shares held. New preferred stock would be convertible into common at rate of two common shares for each preferred share before Jan. 1, 1940. An additional 30,040 shares of common stock would be set aside for sale to officers, employees and directors, with approval of directors, at $6 a share prior to Jan. 1, 1937, and at $7 a share prior to Jan. 1, 1940.

Plymouth Sets Record

DETROIT—Plymouth retail sales during the week ended May 20 totaled 5793 units, an increase of 51.7 per cent over the same week last year, according to H. G. Moock, general sales manager Plymouth Motor Corp. This was the seventh consecutive week that Plymouth sales have shown increases and the third successive week that Plymouth sales nationally have broken all previous records.

107 New Dealers for Studebaker

SOUTH BEND—One hundred and seven new dealers joined Studebaker-Rockne between March 20 and May 20, George D. Keller, Studebaker general sales manager, reports.

New Office for Bristol

WATERBURY, CONN.—The New York office of the Bristol Co. is now located in the Daily News Building, 220 E. 42d St. Mr. C. W. Williamson, district manager, continues in charge.

New Warehouse in St. Louis

CHICAGO—Automotive Warehousing Corp. has opened an automotive warehouse at 3147 Locust Blvd., St. Louis, Mo., President Earl A. Russell announces.